Volume

I

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Plan Overview

A. Organization

This Sustained Yield Plan and Habitat Conservation Plan (SYP/HCP, the Plan) has been prepared by The Pacific Lumber Company, Scotia Pacific Holding Company, and Salmon Creek Corporation (collectively, PALCO) for the purpose of guiding the long-term, landscape-level management of PALCO lands. The Plan is both the SYP required under California's 1997 Forest Practices Rules (FPRs) for PALCO's ongoing commercial timber operations and the HCP prepared in response to the requirements of the federal Endangered Species Act (ESA) and California Fish and Game Code (FGC).

The information, assessments, and measures that comprise the Plan are organized into six volumes:

- **Volume I** (this document) includes a detailed summary of the Plan (Plan Overview), Glossary, list of Plan Preparation Team members, and list of materials in Volumes II-VI. The Plan Overview includes a composite statement of all impact avoidance, minimization, mitigation, and monitoring measures that will be implemented by PALCO under the Plan.

- **Volume II** includes reports on watershed conditions and fish and wildlife. The information and analyses in this volume are supplemented by the HCPs in Volume IV.

- **Volume III** describes the database, model, and results of the long-term sustained yield (LTSY) projection for PALCO's commercial timberlands prepared for SYP purposes.

- **Volume IV** presents the HCPs that PALCO will implement to conserve habitat for, and avoid, minimize, and mitigate adverse effects on, listed and other sensitive species.

- **Volume V** includes oversize color maps produced for the Plan.

- **Volume VI** includes the agreements governing preparation and implementation of the Plan, together with a discussion of the Plan's legal framework.

This organization is intended to facilitate review of the entire Plan by regulatory agencies, government officials, and the interested public while also providing easy access to reports and materials of special interest to individuals.

B. Planning Context

Preparation of this Plan has been guided by:

1. SYP requirements regarding long-term planning, sustained timber production, and resource protection, as stated in the FPRs;

2. Species protection requirements, incidental take provisions, and other sections of the federal ESA and California FGC (including but not limited to the California Endangered Species Act (CESA) and Natural Community Conservation Planning (NCCP) Act);

3. The agreement reached in September 1996 regarding the transfer of approximately 5,600 acres of PALCO property to the United States of America and State of California (Headwaters Agreement); and

4. The Pre-permit Application Agreement in Principle reached in February 1998 regarding components and completion of this Plan and interim measures to be implemented by PALCO (Agreement in Principle).

1. SYP Considerations

This Plan is the SYP prepared by PALCO for approval by the California Department of Forestry and Fire Protection (CDF). As an SYP, the primary purpose of the Plan is to:

1. Establish a LTSY harvest level for PALCO's timberlands;

2. Avoid or mitigate potentially significant adverse impacts on listed and other sensitive species from activities on PALCO's ownership;

3. Avoid or mitigate potentially significant adverse impacts to water quality, fisheries, and aquatic wildlife within watersheds that include PALCO's ownership and/or are affected by activities on the ownership; and

4. Establish procedures for documenting implementation and evaluating the efficacy of the SYP measures.

As specified in the FPRs, the Plan is based on three inter-related assessments:

· A sustained timber production assessment, including a projection of timber inventories, growth, and harvest levels in ten-year increments over the next 120 years;

· A watershed assessment, including an analysis of cumulative effects to determine whether thresholds of concern have been exceeded; and

· A fish and wildlife assessment, including identification (as feasible) of species' habitat needs and the availability, shapes, and distribution of their habitat in relation to harvest and growth.

The required components of SYPs and the legal context provided for the Plan under the California Forest Practices Act, California Timber Productivity Act, and California FPRs are discussed in more detail in Part A of Volume VI.

2. HCP Considerations

Consistent with the objectives of the federal ESA and California FGC, the Plan is a long-term comprehensive program to ensure the continued health of the biological communities on PALCO's property and to minimize and mitigate impacts of PALCO activities on individual species. In this regard, the Plan has both a multi-species and habitat focus; it also has a specific legal purpose with regard to impacts to species and habitats.

Similar to other habitat-based multi-species HCPs (e.g., Plum Creek and plans approved in southern California under the NCCP program), this Plan was developed by focusing on the requirements of selected species (Focus Species) while also addressing the needs of other species in the same habitat. This tiered approach is an essential feature of the Plan's terrestrial and aquatic conservation strategies. Marbled murrelet (***Brachyramphus marmoratus)*** and northern spotted owl (***Strix occidentalis caurina)*** are the Focus Species for the terrestrial strategy, and the measures for these two birds are designed to benefit a broad range of other species in PALCO's managed forests. Some measures, such as the establishment of marbled murrelet conservation areas (MMCAs), preserve and protect Focus and other species in specific locations. Other measures, such as maintaining a mix of seral types across the landscape and retaining structural components of wildlife habitat, benefit Focus and other species by sustaining important features of the larger ecosystem. The Plan's aquatic habitat conservation strategy functions in a similar way. In this case, the Focus Species are four fish (coho salmon, ***Oncorhynchus kisutch;*** chinook salmon, ***Oncorhynchus tshawytscha;*** cutthroat trout, ***Oncorhynchus clarki***, and steelhead trout, ***Oncorhynchus mykiss***). Measures for these species focus on habitat conditions in fish-bearing streams and extend outward to encompass riparian zones and entire watersheds.

By providing for unlisted as well as listed species, the tiered approach of the conservation strategies also is important to the legal purposes of the Plan. As described in Part A of Volume VI, a primary purpose of the Plan is to provide the basis for U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and California Department of Fish and Game (CDFG) to authorize incidental take of certain listed species, including some species that currently are not but may be listed during the life of the Plan. Specifically, PALCO is seeking authorization for incidental take from USFWS and NMFS pursuant to Section 10(a) of the federal ESA and from CDFG pursuant to Sections 2081, 2090, and 2835 of the FGC. For purposes of the ITPs, the Plan:

1. Identifies the species that would be covered by the permits (Covered Species);
2. Treats unlisted Covered Species as if they were listed;
3. Identifies alternatives to the taking and the reasons why the alternatives were not employed;
4. Examines the impacts of the proposed take on the species;
5. Identifies measures to minimize and mitigate impacts;
6. Includes provisions for responding to changed and unforeseen circumstances;
7. Provides assurances that adequate funding is available for implementation; and
8. Provides assurances that the Plan will be implemented.

In connection with ongoing timber operations and implementation of the Plan, PALCO also is seeking a five-year renewable agreement with CDFG pursuant to Section 1603 of the FGC. For purposes of the 1603 agreement, the Plan identifies PALCO activities with the potential to alter streams and riparian areas under CDFG's jurisdiction and identifies the measures that PALCO will implement to avoid, minimize, and mitigate such impacts. This Plan is the HCP submitted with PALCO's ITP applications to USFWS and NMFS and the information and analysis required by CDFG for its consideration of incidental take authorization.

3. Headwaters Agreement

The September 1996 Headwaters Agreement (see Volume VI for copy) contemplates government acquisition of timberlands from PALCO and another landowner for the purpose of preserving

approximately 7,500 acres of old growth, young growth, and associated buffers in a nature reserve. As proposed, PALCO would transfer ownership of two unentered old-growth timber stands and associated buffers (i.e., PALCO's Headwaters and Elk Head Springs timber stands) to the state and federal governments. PALCO also has voluntarily agreed to refrain from logging activities (including salvage logging) in the specified stands pending the development of this Plan. In exchange for the transferred lands, PALCO would receive approximately 7,700 acres of previously harvested timberlands and other consideration (including cash) with an aggregate value of $300 million. Among other things, the Headwaters Agreement conditions the transactions on PALCO's dismissal of pending lawsuits alleging that the state and federal governments have taken PALCO's property in violation of the state and federal constitutions, and on completion and approval of an SYP and HCP for PALCO's property acceptable to PALCO. The transactions also are expressly conditioned on compliance with applicable law, including the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA). This Plan is both the SYP and the HCP cited in the September 1996 Headwaters Agreement.

4. Agreement in Principle

The February 1998 Agreement in Principle (see Volume VI for copy) established a framework for the development of this Plan. It defined certain components of PALCO's ITP applications, addressed procedures for completion of the Plan, and provided for PALCO's implementation of certain conservation measures in the interim. Among other provisions, the agreement:

- Indicates that PALCO will apply for ITPs that cover 50 years;
- Identifies PALCO lands in addition to the Headwaters and Elk Head Springs stands that will be conserved for the marbled murrelet and other species; and
- States PALCO's commitments regarding implementation of specific stream-related measures in pending Timber Harvesting Plans (THPs) prior to issuance of the ITPs and inclusion of those measures in this Plan.

The Agreement in Principle does not provide any advance approval of the Plan by the responsible agencies; and, as with the Headwaters transactions, approval and implementation of the Plan is subject to all applicable laws, including NEPA and CEQA.

This Plan is the HCP submitted with PALCO's ITP applications and includes the provisions of the February 1998 Agreement in Principle. Due to refinements in mapping and definitions determined in consultation with USFWS, NMFS, CDFG, and CDF, some of the acreage estimates and delineation of timber stands in this Plan differ from the approximations in the Agreement in Principle. These differences are traceable to the greater level of detail and accuracy of the information compiled for the Plan since February 1998.

C. Scope of the Plan

1. Plan Area

a. Plan and Permit Area

The Plan Area for this SYP/HCP is defined as PALCO's ownership as it is anticipated to exist on and following the effective date of the ITPs. As shown in Map 2 in Volume V, the initial Plan Area will include approximately 211,700 acres in Humboldt County, California. Except as noted below, the area covered

by the ITPs is the same as the Plan Area. Over time, it is anticipated that additional lands will become part of the Plan Area, be subject to the provisions of the Plan, and, with certain exceptions, be covered by the ITPs. It also is anticipated that over time some lands in the Plan Area may be transferred to other owners through land trades and sales. The Implementation Agreement (IA) for this Plan includes provisions for such additions and deletions (see copy of IA in Volume VI).

b. SYP Planning Units

As required by the FPRs, the Plan identifies the SYP management unit and areas considered in the SYP assessments.

1) SYP Management Unit

The SYP management unit is the same as the Plan Area (see Part B of Volume II for list of assessor's parcel numbers). Changes to the SYP management unit will occur over time as described for the Plan Area.

2) Watershed Assessment Areas and Planning Watersheds

For purposes of the SYP, five watershed assessment areas (WAAs) were delineated based primarily on natural features and the boundaries of California Planning Watersheds (see Map 3 in Volume V). PALCO lands outside the delineated WAAs are treated as a single unit and are identified in the Plan as "Other Lands" and/or "WAA 6." Table 1 indicates the combined area of the WAAs and acres per general land use category; Part C in Volume II provides a general description of the lands in each WAA. Within and adjacent to WAAs, planning watersheds were identified and grouped into hydrologic units. Map 3 in Volume V shows the planning watersheds and hydrologic units; a list of the planning watersheds is included with the description of WAAs in Volume II.

3) Sensitive Watersheds

SYP requirements include the identification of "sensitive" watersheds as defined in the FPRs. None of the watersheds on PALCO lands or in any of the WAAs currently are such "sensitive" watersheds. Three rivers—Van Duzen, Eel, and Mattole—are "water quality limited" as defined in section 303(d) of the Clean Water Act: the Van Duzen and the Mattole because of sediment, and the Eel because of temperature and sediment. In addition, CDF has determined that, in its opinion, five watersheds have significant adverse cumulative effects from sediment. These watersheds are Bear Creek, Stitz Creek, Jordan Creek, Elk River, and Freshwater Creek.

Table 1
Watershed Assessment Areas
(acres)

Ownership Category	WAA 1 Humboldt Bay	WAA 2 Yager	WAA 3 Van Duzen	WAA 4 Eel	WAA 5 Bear-Mattole	WAA 6 Other Lands[1]	TOTAL
PALCO	38,777	34,107	24,934	75,457	34,528	3,903	211,706
Large Industrial	20,148	5,456	9,524	4,036	14,365	0	53,529
Other Private	60,895	44,068	19,998	287,187	204,614	0	616,762
Parks[2]	7,367	23	837	48,930	236	0	57,393
Government[3]	850	900	48	9,768	50,795	0	62,361
Not Classified	553	0	0	568	206	0	1327
Total Area	128,590	84,554	55,341	425,946	304,744	3,903	1,003,078
Ownership Categories							

PALCO	Current ownership, excluding lands to be transferred to government ownership and including lands to be transferred to PALCO under the Headwaters Agreement.
Large Industrial	Other large commercial timber landowners.
Other Private	Small commercial timber landowners and other privately-held lands.
Parks	Local, state, and federal parks and reserves.
Government	Non-park federal and state lands.
Not Classified	Ownership could not be determined.

Notes

1 Includes PALCO lands outside the other five WAAs.
2 Includes the proposed Headwaters and Elkhead Springs reserve in the Humboldt Bay WAA.
3 Includes 7,000+ acres administered by the USDA Forest Service in the Eel WAA.

4) Fish and Wildlife Assessment Area

The area covered by the SYP fish and wildlife assessment is the SYP Management Unit. In evaluating impacts and proposing conservation measures for fish and wildlife, the range of each species was taken into consideration, and the combined area of the WAAs was used to define the bio-region.

2. Plan and Permit Period

As an SYP, the Plan covers a 120-year planning horizon. The term of the ITPs that PALCO is seeking is 50 years.

3. Covered Species

For SYP as well as HCP purposes, listed and other sensitive species potentially affected by activities in the Plan Area have been identified and grouped into List A (Table 2) and List B (Table 3). List A identifies the species for which PALCO is seeking ITPs at this time. The Plan also considers effects on and measures for List B species, but PALCO is not seeking ITPs for List B species at this time. At a later date, PALCO may seek to amend the Plan and ITPs to include one or more of the List B species.

Table 2
Covered (List A) Species

Species Common and Scientific Name	Federal Status	State Status
Focus Species		
Marbled murrelet, ***Brachyramphus marmoratus***	FT	CE
Northern spotted owl, ***Strix occidentalis caurina***	FT	CSSC, BOF
Chinook salmon, ***Oncorhynchus tshawytscha***	FPT	CSSC
Coho salmon, ***Oncorhynchus kisutch***	FT	CCT
Cutthroat trout, ***Oncorhynchus clarki***	FSR	CSSC
Steelhead/rainbow trout, ***Oncorhynchus mykiss***	FSR	CSSC
Other List A Species		
Fish		
Pacific lamprey, ***Lampetra tridentata***		
Amphibians		
Southern torrent salamander, ***Rhyacotriton variegatus***		CSSC
Tailed frog, ***Ascaphus truei***		CSSC
Red-legged frog, ***Rana aurora***		CSSC
Foothill yellow-legged frog, ***Rana boylei***		CSSC

Reptiles		
Northwestern pond turtle, ***Clemmys marmorata marmorata***		CSSC
Birds		
Double-crested cormorant, ***Phalacrocorax auritus***		CSSC
Great blue heron, ***Ardea herodias***		CSA, BOF
Great egret, ***Casmerodius albus***		CSA, CFP, BOF
Snowy egret, ***Egretta thula***		CSA, CFP
Black-crowned night heron, ***Nycticorax nycticorax***		CSA
Osprey, ***Pandion haliaetus***	FSSE	CSSC, BOF, CFP
Bald eagle, ***Haliaeetus leucocephalus***	FT, BEPA	CE, BOF, CFP
Sharp-shinned hawk, ***Accipiter striatus***		CSSC
Cooper's hawk, ***Accipiter cooperi***		CSSC
Northern goshawk, ***Accipiter gentilis***	FS	CSSC, BOF
Ferruginous hawk, ***Buteo regalis***		CSSC
Golden eagle, ***Aquila chrysaetos***	BEPA	CSSC, BOF, CFP
American peregrine falcon, ***Falco peregrinus anatum***	FE	CE, BOF, CFP
Western snowy plover, ***Charadrius alexandrinus nivosus***	FT	CSSC
Burrowing owl, ***Speotyto cunicularia***		CSSC
Vaux's swift, ***Chaetura vauxi***		CSSC
Pileated woodpecker, ***Dryocopus pileatus***		
Purple martin, ***Progne subis***		CSSC
Bank swallow, ***Riparia riparia***		CT
Yellow warbler, ***Dendroica petechia***		CSSC
Yellow-breasted chat, ***Icteria virens***		CSSC
Mammals		
California red tree vole, ***Arborimus pomo***		CSSC
Humboldt marten, ***Martes americana humboldtensi***s		CSSC
Pacific fisher, ***Martes pennanti pacifica***		CSSC

Codes

BEPA	Bald Eagle (and Golden Eagle) Protection Act	FE	Federal endangered species
BOF	Board of Forestry Sensitive Species	FPT	Proposed for federal listing as threatened
CCT	California candidate for listing as threatened	FS	Federal Sensitive Species
CE	California endangered species	FSR	Federal Status Review
CFP	California fully protected	FSSE	Federal Species of Special Emphasis
CT	California threatened species	FT	Federal threatened species

Table 3
List B Species

Species Common and Scientific Name	Listing Status		
Birds	**Federal**	**State**	**Other**
Black-shouldered kite, ***Elanus caeruleus***		CSA, CFP	
Northern harrier, ***Circus cyaneus***		CSSC	
Great gray owl, ***Strix nebulosa***	FS	CE	
Short-eared owl, ***Asio flammeus***		CSSC	
Mammals			
Townsend's western big-eared bat, ***Plecotus townsendii townsendii***		CSSC	
Pallid bat, ***Antrozous pallidus***			
White-footed vole, ***Arborimus albipes***		CSSC	
California wolverine, ***Gulo gulo luteus***		CT, CFP	
Fish			
Green sturgeon, ***Acipenser transmontanus***			
Longfin smelt, ***Spirinchus thaleichthys***			
Eulachon, ***Thaleichthys pacificus***			
Tidewater goby, ***Eucyclogobius newberryi***	FE	CE	
Plants			
Sonoma manzanita, ***Arctostaphylos canescens*** ssp***. sonomensis***			CNPS 1B
Humboldt milk vetch, ***Astragalus agnicidus***		CE	CNPS 1B

Bensoniella, ***Bensoniella oregona***		CR	CNPS 1B
Small groundcone, ***Boschniakia hookeri***			CNPS 2
Leafy reed grass, ***Calamagrostis foliosa***		CR	CNPS 4
Flaccid sedge, ***Carex leptalea***			CNPS 2
Meadow sedge, ***Carex practicola***			CNPS 2
Oregon fireweed, ***Epilobium oreganum***			CNPS 1B
American manna grass, ***Glyceria grandis***			CNPS 2
Glandular western flax, ***Hesperolinon adenophyllum***			CNPS 2
Marsh pea, ***Lathyrus palustris***			CNPS 2
Western lily, ***Lilium occidentale***	FE	CE	CNPS 1B
Running pine, ***Lycopodium clavatum***			CNPS 2
Northern microseris, ***Microseris borealis***			CNPS 2
Robust monardella, ***Monardella villosa*** ssp. ***Globusa***			CNPS 1B
Indian-pipe, ***Monotropa uniflora***			CNPS 2
Howell's montia, ***Montia howellii***			CNPS 1A
Wolf's evening-primrose, ***Oenothera wolfii***			CNPS 1B
Great burnet, ***Sangulsorba officinalis*** ssp. ***microcephala***			CNPS 2
Tracy's sanicle, ***Sanicula tracyi***			CNPS 1B
Maple-leaved checkerbloom, ***Sidalcea malachroides***			CNPS 1B
Siskiyou checkerbloom, ***Sidalcea malvaeflora*** ssp***. patula***			CNPS 1B
Coast checkerbloom, ***Sidalcea oregana*** ssp***. eximia***			CNPS 1B
Robust false lupine, ***Thermopsis robusta***			CNPS 1B
Kneeland prairie penny cress, ***Thlaspi californicum***			CNPS 1B
Beaked tracyina, ***Tracyina rostrata***			CNPS 1B

Codes

CR	California rare species	CNPS	California Native Plant Society list
CSA	CDFG special animal		1A: presumed extinct in California
CSSC	CDFG species of special concern		1B: rare or endangered in California and elsewhere
CT	California threatened species		2 : rare, threatened, or endangered in California but more common elsewhere
CE	California endangered species		
CFP	California fully protected	FE	Federal endangered species
		FS	Federal sensitive species

4. Covered Activities

Subject to the conditions and restrictions identified in this Plan and specified in the ITPs, activities covered by the authorizations for incidental take will include:

- All phases and aspects of timber management;
- Road and landing construction, improvement, and maintenance;
- Gravel extraction operations at specific locations;
- Existing rock quarry operations;
- Grazing as limited herein;
- Stream enhancement projects;
- Operation of PALCO's fish-rearing facilities;
- Scientific surveys and studies;
- Limited types of recreation; and
- Activities reasonably associated with the above activities.

A brief description of the activities follows; limitations and restrictions that will apply to the activities under the Plan are presented in section "G. SYP/HCP Measures".

a. Timber Management

Timber management is the primary activity in the Plan Area, occurring on approximately 203,000 acres. Management activities include timber harvest and regeneration, site preparation, planting, vegetation management, thinning, fertilization, and fire suppression.

1) Timber Harvesting and Regeneration Methods

Before a forest stand can be harvested, a Registered Professional Forester (RPF) must prepare a THP. The THP is reviewed by state and, in some cases, federal agencies for consistency with all applicable laws and regulations to ensure that potentially significant environmental impacts are analyzed and fully mitigated to the extent feasible. This requirement has applied to commercial timber operations in California since 1973 (see Part A in Volume VI for additional details).

In the Plan Area, even-aged and uneven-aged silvicultural prescriptions will be used. Even-aged silviculture is used to regenerate a stand of trees approximately the same age. This objective is achieved by harvesting stands in blocks that typically range in size from 20 to 30 acres. Harvest methods include seed tree removal, shelterwood removal, and clearcutting. Regeneration occurs artificially through the planting of nursery-grown seedlings, or naturally by well-distributed seed trees. Uneven-aged silviculture is used to harvest trees individually or in small groups, with the goal of developing or maintaining a variety of age classes within a stand. Typically, sites are restocked through natural regeneration; where necessary, seedlings obtained from a nursery also are used.

Harvesting operations begin with the felling and bucking of trees. Logs are moved (yarded) to a landing site using methods determined based on topographic considerations, access, worker safety, and other factors. Generally, tractor-based systems are used on relatively mild terrain, cable yarders are used on steeper slopes, and helicopters are used in areas where road access is a problem. At the landings, the logs are loaded onto trucks and transported to processing facilities (mills) over private and public roads.

2) Site Preparation

Depending on site conditions, excessive amounts of slash (mostly branches from trees) and unwanted shrub and tree species are removed. This is typically accomplished by a broadcast burn or, less commonly, mechanical methods. This treatment only applies to clearcut sites where excessive quantities of slash prevent tree planters from successfully planting trees uniformly throughout the harvest unit. The treatment also has the additional benefit of reducing the potential for wildfire to ignite or spread through the site. Broadcast burning permits must be obtained from CDF and the regional air quality board. If needed, fire trails are constructed to protect resources at risk (e.g., riparian habitat adjacent to a stream). Personnel are located on-site to monitor the burn and to take action in the event of an escape.

3) Planting

Artificial regeneration is principally used to ensure that stocking requirements specified in the FPRs are met. The usual practice is to plant seedlings in those areas that have been clearcut. Seedlings are purchased from a variety of vendors and selected to fit the environmental conditions of site where they will be planted.

4) Vegetation Management

Some sites may require one or more vegetation management treatments to reduce the impacts of unwanted competing vegetation on the growth of seedlings. Such treatments commonly involve the application of herbicides. Depending on site conditions, mechanical methods may also be used to control unwanted vegetation.

The herbicides that PALCO anticipates using for vegetation management include atrazine, glyphosate, sulfometuron, triclopyr, 2,4-D, imazapyr, and hexazinon. The herbicides are applied following procedures outlined by their manufacturers and approved by the Department of Pesticide Regulation. Contractors must be certified by the state to handle and apply these chemicals. Aerial application methods are not currently used and will not be allowed under the Plan to control unwanted vegetation. In areas where herbicides will be allowed under the Plan, ground-based applications will be used. Using this method, applicators with backpack sprayers walk throughout the site and only apply the herbicide where it is needed to control unwanted vegetation. This method greatly reduces the potential for these chemicals to enter streams. In the event of a significant spill, PALCO has a contingency plan to respond and control the chemical (see Part P in Volume II). PALCO also has a water quality monitoring program to help ensure that the beneficial uses of water are not compromised by herbicide applications.

Limitations under this Plan on the use of herbicides are identified in “Stream and Riparian Habitat Conservation” in section “G. SYP/HCP Measures” and are discussed in detail in the Aquatic Species Conservation Plan in Volume IV. The limitations include no use of herbicides in riparian management zones (RMZs) along Class I and II streams

5) Thinning

Overstocked even-aged stands will be thinned, where appropriate, to redistribute the growth potential of the site to fewer conifer trees. When such an operation occurs in a very young stand (approximately 15 years old), it is called precommercial thinning. Stems are cut down and left on the site to decay. Commercial thinning requires preparation of a THP and may occur as early as 35 years. Leave trees (i.e., the trees that will be retained) are selected to ensure that they are evenly distributed throughout the site and have the potential to take advantage of the increased growing space. The harvested trees are yarded to a landing, loaded onto trucks, and transported to a processing facility.

6) Fertilization

On some sites, application of fertilizer can dramatically increase the growth of potential crop trees. PALCO has not recently applied such treatment on its timberlands; however, this practice is used by timber companies throughout the nation to increase growth at a very reasonable cost. The most common treatment is aerial application of nitrogen (N) fertilizer (e.g., 200 lbs. N/acre applied as urea) approximately ten years before final harvest.

Limitations under this Plan on the use of fertilizers are identified in "Stream and Riparian Habitat Conservation" in section "G. SYP/HCP Measures" and are discussed in detail in the Aquatic Species Conservation Plan in Volume IV. These limitations include no aerial applications, and ground applications for erosion control only, in RMZs along Class I and II streams

7) Fire Suppression

In response to wildfires, activities similar to those used for escaped control burns are used to minimize the total number of affected acres. These activities will be covered by the ITPs and, under this Plan, fire management plans will be prepared for the MMCAs.

b. Roads and Landings

Activities for the maintenance, improvement, construction, and closure of roads and landings include:

1. Implementation of PALCO's storm-proofing program;

2. Construction of new roads in connection with timber management, including clearing vegetation from road rights-of-way, removing trees, grubbing (removing stumps and surface organics), grading, and compaction;

3. Extraction of rock, sand, and gravel from small borrow pits for use in road construction and maintenance, drainage facility repair, and erosion control;

4. Construction of stream crossings (bridges, culverted fills, fords, and a variety of temporary crossings);

5. Maintenance of surfaced roads, seasonal roads, culverts, bridges, fords, cuts and fillslopes; and

6. Closure of roads, temporarily (i.e., decommissioned) or permanently (i.e., abandoned).

Approximately 150 miles of new roads will be added in the Plan Area in the first decade of Plan implementation; 100 miles in the second decade, 75 miles in the third decade, 50 miles in the fourth decade, and 25 miles in the fifth decade. In the sixth decade and thereafter, levels of new construction should not exceed levels of road abandonment, maintaining a relatively constant level of road miles. At least 500 miles of existing roads will be storm-proofed per decade within the first 30 years until all roads on the property have been brought up to that standard.

Additional details regarding road-related activities are provided in the Guidelines for Forest Roads and Landings (Part N of Volume II).

c. Near-Stream Gravel Mining

PALCO currently conducts surface mining operations to extract gravel aggregate from river bar deposits in the Eel River upstream from the confluence of the Van Duzen and Eel rivers. These activities are conducted under an existing permit from Humboldt County and a Letter of Permission (LOP) from the U.S. Army Corps of Engineers (COE). In accordance with Section 7 of the federal ESA, COE completed an interagency consultation with NMFS, and NMFS produced a biological opinion regarding the effects of the LOP on listed fish species.

PALCO's existing LOP (#21641N) was issued last in October 1996 for an effective period of three years or until December 31, 1999. Consistent with the LOP, a maximum of 160,000 cubic yards per year may be extracted from the several bars comprising the Eel River operations; no more than 30,000 cubic yards can be removed from each bar each year; and no extractions are allowed in the wetted channel. In each of the three years covered by the LOP, PALCO must produce engineered cross-sections of the relevant gravel bars or deposit sites before and after extraction operations (if any). Extraction volumes are limited to amounts recruited and deposited each winter and constrained by the maximum permitted extraction volumes. Impacts of gravel extraction are minimized, mitigated, and monitored in accordance with measures reviewed by the County of Humboldt Extraction Review Team (CHERT) and approved by the various permitting agencies. Measures required under the existing LOP include the following:

1. PALCO must "make every reasonable effort to conduct activities authorized in a manner that will minimize any adverse impact of the work on water quality, fish and wildlife, and the natural environment, including adverse impacts to migratory waterfowl breeding areas, spawning areas, and riparian areas."

2. All temporary fills within waters of the U.S. must be removed in their entirety.

3. All extraction activities in the vicinity of federal projects must be coordinated for required setback distances with the COE office prior to application for a permit.

4. Heavy equipment working on wetlands must be placed on mats, or other measures must be taken to minimize disturbances to soil.

5. No authorization is granted under the LOP procedure for any activity that is likely to a) jeopardize the continued existence of a listed species or species proposed for listing under the ESA, or b) destroy or adversely modify the critical habitat of such species.

6. PALCO must notify the District Engineer if any listed species, proposed species, or critical habitat might be affected by, or is in the vicinity of, the project, and work on the project may not begin until the COE has notified PALCO that the project meets COE and ESA requirements.

7. The project must not significantly disrupt the movement of indigenous aquatic species or species that normally migrate through the project area.

8. PALCO must comply with LOP requirements regarding vegetation mapping, anadromous fish habitat mapping and monitoring, amphibian surveys, bird surveys and monitoring, and related measures (see summary of permit conditions in Part I of Volume II).

For purposes of this Plan, it is assumed that

- Mitigation and monitoring requirements under any future renewal of the LOP will be the same or similar to current requirements; and

- PALCO will comply with the measures required as conditions of the COE LOP or permit.

d. Commercial Rock Quarries

PALCO operates two permitted commercial hard rock quarries in the Plan Area. The two commercial quarries are identified as Rock Quarry 1/Road 24 and Rock Quarry 2/Road 9.

- Rock Quarry 1/Road 24 is located in the Yager Creek drainage, approximately five miles upstream from Carlotta, California. The approved Humboldt County conditional use permit and the approved mining and reclamation plan for the quarry provide for a total production of approximately 125,000 cubic yards of aggregate material. The entire quarry site includes approximately 3.5 acres.

- Rock Quarry 2/Road 9 is located in the Lawrence Creek drainage of the Yager Creek watershed. It was operated for many years for in-house use only and, following approval of the conditional use permit, is mined for commercial purposes. The volume of available material in Quarry 2 is estimated at approximately 450,000 cubic yards.

These two existing quarry operations will be covered by the ITPs. If additional quarry sites are proposed, PALCO may propose amendments to the ITPs and Plan to cover the new operations.

Quarry operations involve excavation, drilling, blasting, screening, loading and hauling, and activities ancillary to the quarry operation include road relocation, erosion control, annual closure, and final reclamation. Materials are hauled off-site and transported by truck or rail to their ultimate destination for use as slope stabilization, bedding, and road base. Operations are seasonal, with most mining occurring from April through November. Minor quarrying may occur from December through March in response to local demand for material or the need to provide material for erosion control or road storm-proofing activity. Additional information about the quarries is provided in Part J of Volume II.

PALCO also uses many small sand or rock sources (borrow pits) in the Plan Area for road maintenance, drainage facility repair, and erosion control. Because of their small size and minor impacts, these borrow pits do not require permits under federal or state regulations and are not mapped or inventoried. Activities associated with these borrow pits are part of PALCO's road and sediment control program and are covered by the ITPs.

e. Grazing

Grazing has occurred on PALCO lands for more than 100 years. Currently, approximately 5,800 acres in different parts of the Plan Area are leased for grazing (Table 4; also see Map 32 in Volume V). These areas include a combination of young plantations, prairies, and pastures. Approximately 600 head currently graze on the property, down from historical levels of 2,000 to 3,000 head (one head = one cow-calf pair). Under this Plan, the number of head will not exceed 1,000 head at any one time during the term of the ITPs. Additional information about current and future grazing activities in the Plan Area is included in the Aquatic Species Conservation Plan in Volume IV.

Table 4 Grazing Areas in the Plan Area		
Area	**Acres**	**Head of Livestock**
Yager Camp Area	12	10
Corbett Ranch Area	23	10
Riverside Acres	30	Horse grazing
North Rainbow Ranch	830	100
South Rainbow Ranch	1,797	100
Chalk Mountain Area	71	10
Patmore Cabin Area	442	30
Moore's Prairie	160	30-40
Chase Ranch	1,250	130
Hartman Ranch	450	40
Bowlby Piece	40	20
Townsend Ranch	100	20
Moore Ranch	200	30
Schmidbauer Ranch	350	None yet
Casacca Ranch	24	30 yearlings

f. Stream Enhancement Projects

PALCO currently performs stream habitat enhancement work under an ongoing cooperative agreement with CDFG. Approximately 50 projects are completed each year, ranging from development of pool structures to removal of major blockages. A list of past and current projects is included as Part G in Volume II; Map 18 in Volume V shows the location of stream enhancement projects.

g. Operation of Fish-Rearing Facilities

PALCO has operated a fish rearing facility at its Yager Logging Camp since 1960 and installed a new facility in Scotia in 1997. In addition, rearing facilities (acclimatization tanks) are maintained at two remote sites in the Yager Creek basin. Operation of the fish-rearing facilities involves significant regulatory oversight by CDFG. Currently, the facilities are used only to capture, raise, and release the eggs and young of wild anadromous fish collected from the Yager basin. As proposed in this Plan, the ITPs will cover the unintentional trapping, capture, or take of listed fish species (such as coho salmon) in the course of collecting unlisted species for the fish-rearing facilities. Collection of listed fish species will require a ESA Section 10(a)(1)(A) permit from NMFS and equivalent authorization under state law as appropriate.

h. Scientific Surveys and Studies

Scientific surveys and studies are conducted in the Plan Area by PALCO personnel and contractors, resource agency staff, and independent researchers. Surveys and studies of listed species are subject to approval by the federal and state agencies with jurisdiction over the species and, if collection or other forms of take is involved, a federal ESA Section 10(a)(1)(A) permit and equivalent state authorization is required as appropriate. PALCO currently is seeking a Section 10(a)(1)(A) permit from NMFS for scientific collection of coho salmon.

i. Recreation

Most of the Plan Area lands are closed to the general public for recreational activities. Certain CDFG regulated hunting and fishing access is allowed for employees by permission. In addition, there are six developed recreational sites in the Plan Area (see Map 33 in Volume V for location):

- **Boy Scout Camp.** This facility is a converted logging camp that has been used for decades by the Boy Scouts of America for organized camping activities. The activities include hiking, archery, arts and crafts, and other common scouting activities. A caretaker lives at the camp.

- **Archery Club.** This facility is used by an organized archery club for archery meets approximately once every two months. The participants (about 50-70 people) traverse a course shooting at various targets.

- **Church Camp.** A church organization maintains a relatively developed small campground along the Elk River which they use occasionally in the summer for organized campouts. A caretaker lives periodically at the camp.

- **Hunting Camp - Tent City.** A hunting camp in the Rainbow Ridge area is used during the fall for small group hunting trips. The facility involves a cabin and some outbuildings. Groups stay for two to three days and are generally 16 to 20 in number.

- **Runerberg Camp.** A Finnish cultural group maintains a lightly developed campground adjacent to the Van Duzen River and uses it for occasional organized campouts. The facility is directly adjacent to a residential subdivision.

- **Demonstration Forest.** PALCO operates a demonstration forest near Jordan Creek. The facility has picnic areas, a restroom, and a self-guided nature trail. In the summer, it is staffed with a host. It is open to the public.

The activities that occur at these sites are not expected to affect the Covered Species, and as such will not be limited by this Plan.

D. Baseline Conditions

Detailed information about resources and conditions in the Plan Area was compiled for SYP and HCP purposes. Table 5 provide summary information about forest seral types, site productivity classifications, watercourses, Watercourse and Lake Protection Zones (WLPZs), roads, land slide hazard ratings, and watershed disturbance levels. The diversity of species, occurrence of listed and other species, habitat types and conditions, water quality, and air quality in the Plan Area also are described below.

1. Seral Types and Site Productivity Classes

a. Seral Types

Plan Area lands were classified into eight types based on seral stage and vegetation type. Table 5 indicates the acres per type per WAA; Map 5 in Volume V shows the distribution of types.

Table 5
Baseline Conditions

Factor	WAA 1 Humboldt	WAA 2 Yager	WAA 3 Van Duzen	WAA 4 Eel	WAA 5 Bear-Mattole	WAA6 Other Lands	TOTAL
Seral Type (acres)							
Forest Opening	2,521	989	759	5,454	2,882	11	12,616
Young Forest	6,120	15,282	2,971	12,325	1,804	0	38,502
Mid-successional	12,069	11,014	14,306	25,878	21,140	3,364	87,771
Late Seral	17,461	3,881	5,907	24,440	1,541	6	53,236
Old Growth	71	1,761	153	1,098	3,360	0	6,443
Hardwood	246	221	61	3,010	487	241	4,266
Prairie	0	277	55	973	2,251	281	3,837
Open/Non-timber	289	684	721	2,275	1,069	0	5,038
Site Productivity (acres)							
Site Class 1	516	676	1,388	1,711	43	0	4,335
Site Class 2	37,830	32,098	22,342	68,194	27,739	3,334	191,536
Site Class 3	142	347	460	1,827	2,990	198	5,964
Site Class 8	0	35	14	515	487	89	1,141
Site Class 9	289	954	729	3,206	3,271	281	8,729
Watercourses (stream miles)							
Class I	52	56	30	80	44	3	265
Class II	131	123	83	280	118	16	751
Totals	183	179	114	360	161	19	1,017
WLPZs (acres)							
Class I WLPZs	2,113	2,267	1,256	3,577	1,731	140	11,084
Class II WLPZs	2,995	2,686	1,870	6,312	2,648	356	16,866
Totals	5,108	4,953	3,126	9,889	4,378	496	27,951
Roads (miles)							
Paved/Rocked	117.0	142.7	50.5	181.1	15.1	4.7	511.1
Dirt	163.6	125.7	123.4	388.4	141.6	7.0	949.7
Storm-proofed	9.5	29.1	0	0	0	0	38.6
Reconstructed	8.4	0.5	3.3	16.3	1.6	0	30.1
Decommissioned	0	1.6	0	0	0	0	1.6
Abandoned	0.6	1.3	0	0	0	0	1.9
Total Existing	299.1	300.9	177.2	585.8	158.3	11.7	1,533.0
Proposed (First Decade)	43.1	15.8	14.8	57.1	15.1	0.4	146.3
Existing and Proposed	342.2	316.7	192.0	642.9	173.4	12.1	1,679.3
Surface Erosion Ratings (acres)							
Low	28,471	29,249	15,263	44,354	12,548	1,905	131,791
Moderate	10,201	4,811	9,201	28,964	20,510	1,651	75,338
High	1	20	108	372	1,331	347	2,178
Extreme	104	27	362	1,151	139	0	1,782
No Data	0	0	0	617	0	0	617
Landslide Hazard Ratings (acres)							
Very Low	557	302	1,614	5,965	4,894	438	13,770
Low	22,842	6,745	9,036	32,046	8,587	382	79,638
Moderate	8,643	2,681	4,724	21,648	8,743	107	46,546
High	2,195	986	1,868	10,805	7,900	7	23,761
Very High	263	364	532	3,557	4,187	0	8,903
Extreme	0	1	5	146	206	0	358
No Data	4,278	23,028	7,155	1,291	11	2,969	38,731
Disturbance Index (%)	15.5	16.8	5.9	12.8	4.3	Not known	11.5

- ***Forest opening.*** This type is characterized by grass, brush, and conifer seedlings. As a seral type, it lasts until the conifers are about 1" diameter at breast height (DBH). Grasslands in this category include areas that were converted from conifer types in the past.

- ***Young forest.*** This type is made up of conifer saplings that are about 1" to 11" DBH. It consists of stands that are generally 10 to 20 years old.

- ***Mid-Successional.*** This type is characterized by trees about 12" to 24" DBH. Most timber stands of this type are generally 20 to 50 years old.

- ***Late seral.*** Late seral forest is made up of stands with overstory trees that on average are larger than generally 24" DBH and may have developed a multi-storied structure. It occurs in stands as young as 40 years old but more typically in stands about 50 to 60 years old and older. Late seral includes forests classified under the California Wildlife Habitat Relationships (CWHR) system as late successional types 5M, 5D, and 6.

- ***Old growth***. Technically, old growth is a late seral type. In this Plan, it is treated as a distinct category and includes only unentered old growth stands. These stands generally have multiple canopy layers dominated by trees over 30 inches DBH, with a shrub and herb layer and high snag and down log levels. (Residual old growth (i.e., remnants of old growth in previously harvested stands) is treated as a component of other seral stages, depending on residual tree density.) Redwood and Douglas-fir old growth also are differentiated in this Plan. Old-growth Douglas-fir trees often occur in association with redwood on moist, well-drained sites and, on drier sites, are frequently associated with hardwoods such as tanoak and madrone. Douglas-fir trees also are typically scattered in redwood-dominated old growth and residual stands. In the Bear-Mattole WAA, the older Douglas-fir trees (approximately 150 to 200 years old) may occur in relatively pure small stands, but more commonly, in heterogeneous stands with tanoak and madrone trees in a variety of size classes.

- ***Hardwoods.*** This type consists of timber stands where the dominant tree species are tanoak, madrone, or alder; it does not include conifer stands that have a hardwood component. The hardwood stands occur primarily in the drier and higher elevation sites on the property, and some are stands converted from conifer forest by past management activities.

- ***Prairie (grassland).*** This type includes naturally-occurring grasslands and areas converted to pastures for livestock grazing.

- ***Open/Non-timber.*** The open/non-timber type includes industrial, commercial, and residential sites, rock areas, and stream channels, or other lands committed to uses other than the growing and harvesting of timber.

b. Site Productivity Class

Five CDF site productivity classifications apply to the Plan Area: Site Class 1 (timberland with the best timber growth potential), Site Class 2 (timberland with intermediate timber growth potential lower than class 1 and higher than class 3), Site Class 3 (timberland with intermediate timber growth potential lower than class 2), Site Class 8 (timberland of poor timber growth potential and frequently dominated by hardwoods), and Site Class 9 (non-forest land). The Plan Area is primarily Site Class 2. Table 5 indicates the acres per classification per WAA; Map 6 in Volume V shows the distribution across the ownership.

2. Watercourses and WLPZs

Watercourses on PALCO lands were categorized as Class I, II, or III based on the FPRs as they existed and were interpreted as of May 1, 1998. In summary, each class is defined as follows:

- Class I watercourses always or seasonally have fish present and include habitat to sustain fish migration and spawning; or are within 100' of a downstream domestic water supply. As indicated in Table 5, there are approximately 265 miles of Class I streams in the Plan Area.

- Class II watercourses have habitat for nonfish aquatic species and/or are within 1,000' of a downstream watercourse where fish always or seasonally are present. Class III watercourses that are tributary to Class I watercourses are excluded from this category. There are approximately 751 miles of Class II streams in the Plan Area.

- Class III streams do not have aquatic life present in them but show evidence of being capable of sediment transport to Class I or II waters under normal high flow conditions after completion of timber operations. The location of Class III streams on PALCO's ownership has not been mapped; however, it is roughly estimated that there are approximately 3,200 miles of Class III streams on the property.

California FPRs require WLPZs along Class I and II streams and impose equipment exclusion and limitation zones on Class III streams. As indicated in Table 5, approximately 27,951 acres in the Plan Area are within Class I and II WLPZs. Map 7 in Volume V depicts their distribution across the ownership.

In the reports in this Plan, the terms "streamside protection zone" and "Class I and II buffer" often are used interchangeably with "WLPZ". Unless otherwise noted, these terms mean WLPZ as defined in the FPRs. When the term "RMZ" is used, it means the areas adjacent to Class I, II, and III streams where measures identified in the Aquatic Species Conservation Plan (see Volume IV) will be implemented.

3. Roads

Currently there are approximately 1,533 miles of existing roads and approximately 146 miles of proposed roads in the Plan Area. (The proposed roads are those that will be built during the first decade of the Plan.) Table 5 indicates the miles per type per WAA; Map 8 in Volume V shows the distribution across the Plan Area.

4. Watershed Sensitivity and Disturbance

Watershed sensitivity and disturbance levels were evaluated in terms of geomorphic sensitivity and timber management effects. As a prelude to the detailed fisheries analysis that is the basis for the Aquatic Species Conservation Plan, PALCO also conducted a general watershed assessment.

Geomorphic sensitivity was evaluated based on information from the California Department of Mines and Geology and other sources. Surface erosion risks were analyzed and rated using methods contained in the FPRs, Technical Rule Addendum Number One; landslide risks were evaluated using an approach developed by Pacific Watershed Associates (PWA). Volume II includes a detailed description of PWA's approach. Table 5 indicates the results of the ratings in terms of acres per ranking per WAA. Maps 9-13 in Volume V illustrate the underlying database and results of the sensitivity ratings.

To estimate impacts from management activities over time, PALCO worked with PWA to develop a disturbance index (DI). In connection with the development of the DI, PALCO also compiled and mapped information regarding when forested lands in the Plan Area were first harvested, with first harvests grouped in decades from 1860 to the present (see Map 14 in Volume V).

The DI approach is patterned after the "equivalent roaded area" (ERA) methodology used by the U.S. Forest Service (USFS) to assess cumulative watershed impacts and, as recommended in the USFS handbook, is customized to address local conditions. Each type of silvicultural activity is assigned a disturbance rating that reflects the intensity and duration of effects; a 10-year time factor is applied to account for diminishment of effects. In the DI calculation, silvicultural practices and yarding methods applied to an area over the past 10 years are identified. The acres of a treatment are multiplied by the disturbance rating for the silvicultural practice and by the rating for the yarding method. For each year elapsed since the treatment occurred, the disturbance level is reduced by 10%. The calculations for each treatment are then summed and divided by the total acres in the area, expressing the DI as a percentage. Based on the methodology and assumptions described in more detail in Part E of Volume II, a baseline DI for PALCO lands in each WAA was calculated. Other lands (WAA 6) were not included in this calculation. Results are indicated on Table 5.

5. Diversity of Wildlife, Fish, and Plants

The diversity of wildlife, fish, and plant species on PALCO lands (including but not limited to Covered Species) is known from surveys and studies conducted in the Plan Area and bio-region, information collected by federal and state agencies, and incidental observations by biologists and foresters.

Primary sources of information about wildlife species in the Plan Area include:

- Results of multi-species monitoring program conducted in 1995-1997;
- Surveys conducted as part of the THP process;
- Surveys and studies conducted as part of the preparation of this Plan;
- Information available from the California Natural Diversity Data Base;
- Information provided by USFWS and CDFG; and
- Review of extant literature.

The report on the multi-species monitoring program (Part K in Volume II) identifies vertebrate wildlife species that do or may occur in the Plan Area. No listed invertebrate species are known to occur on PALCO lands.

Primary sources of information about fish species in Plan Area streams include:

- CDFG data sets on fish populations, collected from 53 streams in the Plan Area from 1989 to 1995 through a program developed by CDFG's Inland Fisheries Division.

- Data on hatchery production and hatchery releases provided by the Humboldt Fish Action Council and from PALCO's internal hatchery records; and

- Anecdotal information provided by CDFG staff, NMFS staff, and local fisheries biologists.

To date there is no comprehensive survey of the distribution of anadromous fish within the bio-region; consequently, data to definitively determine fish distributions are not available. Available information is summarized in the Aquatic Species Conservation Plan in Volume IV.

Regarding plants, the multi-species monitoring program identified 102 plant species in the Plan Area. In addition, PALCO retained Natural Resources Management Corporation (NRM) to prepare a habitat-based botanical assessment of the Plan Area. As part of that assessment, NRM compiled a list of plant species associated with the primary habitat types found in the bio-region.

6. Listed and Other Sensitive Species

As noted in "C. Scope of Plan," the species identified in Tables 2 and 3 are the listed and other sensitive species observed or potentially occurring in the Plan Area.

a. List A (Covered Species)

Table 6 summarizes what is known about the occurrence of the Focus Species and other List A species in the Plan Area. Detailed information about the occurrence of List A species is provided in the Marbled Murrelet Conservation Plan, Northern Spotted Owl Conservation Plan, Aquatic Species Conservation Plan, and Conservation Plans for Other List A Wildlife in Volume IV.

Of the Focus Species, the northern spotted owl is the most widely distributed on PALCO lands (see Maps 15 and 27 in Volume V). Habitat potentially suitable for one or more of the Focus fish species occurs in most perennially flowing streams in the Plan Area for at least part of the year (see Map 16 in Volume V); however, barriers (e.g., waterfalls) prevent fish access to many such areas. Of the other List A species, the southern torrent salamander and California red tree vole are widespread in suitable habitat in the Plan Area. Incidental observations also indicate that the red-legged frog is locally abundant.

b. List B Species

In general, information about the occurrence of List B species in the Plan Area is limited. Available information is presented in the Conservation Plans for List B Wildlife and Plant Species and the Aquatic Species Conservation Plan in Volume IV.

Four plants, one fish, one bird, and one mammal on List B are federally and/or state listed; they are: bensoniella, Howell's montia, leafy reed grass, western lily, tidewater goby, great gray owl, and California wolverine. Potential habitat for bensoniella and Howell's montia is patchy in the Plan Area, and there is no record of their occurrence in the plan area. Habitat for leafy reed grass is limited to the western portion of the Plan Area, and there is no record of its occurrence. Habitat for western lily is limited in the Plan Area, and there is no record of its occurrence. The great gray owl is considered an accidental species in the bio-region, and there are no records of occurrence on or near the PALCO lands. The reported range of the wolverine does not overlap PALCO lands, but the species could potentially occur on the property.

7. Habitat Types and Conditions

To provide a better understanding of the diversity and components habitats in the Plan Area:

- PALCO's ownership was classified by CWHR types;
- Data from the multi-species monitoring study were analyzed for correlation between forest type/seral stage and species occurrence;

Table 6 Distribution of List A Species in the Plan Area	
List A Focus Species	
Marbled murrelet	Most old growth and some residual stands in Plan Area considered actual or potential nesting habitat for this species. Occupied behaviors detected in surveys in 26 stands.
Northern spotted owl	Widely distributed in Plan Area; 147 known owl sites on PALCO ownership. Plan Area includes approximately 80,300 acres of high quality nesting habitat, 10,600 acres of medium quality nesting habitat, 70,300 acres of low quality nesting habitat, 10,800 acres of roosting habitat, and 18,000 acres of foraging habitat.
Chinook salmon	Occur in low numbers throughout Plan Area; data on abundance and distribution within individual watersheds varies. Habitat estimated to occur in approximately 82 miles of streams in the Plan Area.
Coho salmon	Known or thought to occur in large number of streams in each Plan Area watershed; data on abundance and distribution within individual watersheds varies. Habitat estimated to occur in approximately 66 miles of Plan Area streams..
Cutthroat trout	Anadromous cutthroat known to occur in Eel River, Strongs Creek in the Eel watershed, in the North Fork Elk River watershed, and Freshwater Creek; data generally not available on occurrence in other areas. Habitat estimated to occur in approximately 31 miles of Plan Area streams.
Steelhead trout	Most widely distributed salmonid in the Plan Area. Within upper Eel WAA, distribution limited by Scott Dam. Data on abundance and distribution within individual watersheds varies. Habitat estimated to occur in approximately 152 miles of streams in the Plan Area.
Other List A Species	
Pacific lamprey	Many streams on ownership have suitable spawning conditions. Many reaches do not have suitable habitat for ammocoetes, but suitable habitat occurs downstream in lower reaches of streams off PALCO property. Known to occur in the Humboldt, Van Duzen, and Eel WAAs, but status uncertain in Yager and Bear-Mattole WAAs.
Southern torrent salamander	Widely distributed in suitable habitat in Plan Area. Observed in Bear-Mattole, Yager, Eel, Humboldt, and Van Duzen watersheds.
Tailed frog	Patchy but widespread distribution in suitable habitat in Plan Area. Observed in Humboldt, Yager, Van Duzen, Eel, and Bear-Mattole watersheds. Only the high gradient reaches with substrates of consolidated parent material likely to contain suitable habitat.
Red-legged frog	Based on incidental observations, locally abundant in suitable habitat in the Plan Area. Observed in Eel, Humboldt, and Van Duzen watersheds; presumed to occur in other watersheds.
Northwestern pond turtle	Habitat relatively limited on the PALCO ownership; species detected in or near some of the major watercourses in Yager and Eel watersheds. Pond turtles appear to be present in low numbers in suitable habitat.
Double-crested cormorant	A common resident and breeder, but no records of inland nesting. Seen flying to and from foraging areas along the Eel and Van Duzen rivers.
Great blue heron	Commonly seen foraging on the rivers and large creeks in the Plan Area; records include individual nests or small aggregation of nests found along river corridors.
Great egret	Indian Island in Humboldt Bay is major breeding area in bio-region. No rookeries are known on PALCO lands. Low numbers of great egrets (generally 1 to 3) seen foraging along the Eel or Van Duzen Rivers during the spring and summer. Groups of 10 or 20 often seen among grazing cattle in winter months.
Snowy egret	No rookeries and no observations on PALCO lands.
Black-crowned night heron	As with other herons and egrets, Indian Island is important local breeding area. No rookeries known to occur on PALCO lands; occasional sightings of individuals in flight.
Osprey	Relatively common during the breeding season in the Plan Area along the Eel River and some of its tributaries and at Elk River near Eureka. Approximately 63 osprey nests (either historic or active) known from areas on or immediately adjacent to PALCO ownership.
Table 6 (Continued) **Distribution of List A Species in the Plan Area**	
Bald eagle	No nest site records for PALCO ownership. Wintering birds rare to relatively common along Yager Creek and the Eel, Elk, and Van Duzen rivers; also seen along lower

	Larabee Creek, near confluence with Eel River. Seen on PALCO lands generally between November and March (same time as runs of anadromous fish); 3-7 wintering birds seen in Yager watershed, 1-2 in Eel and Humboldt watersheds.
Sharp-shinned hawk	Common migrant and winter visitor; uncommon summer resident and breeder. Infrequent incidental observations during breeding season in Plan Area; may be present in low numbers. Observed in winter in Humboldt, Yager, and Bear-Mattole watersheds. No records of nesting in the Plan Area.
Cooper's hawk	An uncommon resident, more regularly seen in winter; breed sparingly throughout region. Observed in Van Duzen, Yager, Eel, and Bear-Mattole watersheds. One recorded nest site on PALCO lands, in the Van Duzen watershed.
Northern goshawk	No nests found to date in Plan Area; incidental sightings in the coastal lowlands in fall and winter. Two observations in Yager watershed.
Ferruginous hawk	A locally rare winter visitor. Seen during the winter months perched low in trees in open pastures. No breeding records for California. Observed in the Plan Area in Eel and Van Duzen watersheds.
Golden eagle	Rare to uncommon resident and breeder in bio-region. PALCO observations are from the Yager, Bear-Mattole, Eel, and Humboldt watersheds. There are nesting records for PALCO lands in Larabee Creek.
American peregrine falcon	In north coast region, an uncommon migrant and winter visitor; a rare, local breeder (approximately eight known sites in bio-region.), and summer resident. One recorded nest site in Plan Area, on cliff adjacent to Eel River; site may have been damaged or eliminated during the winter of 1995 due to failure of the rock face.
Western snowy plover	Uncommon local migrant and winter visitor; rare, local breeder. Observed in bio-region on inland river bars from the Eel River Delta upstream to at least the mouth of the Van Duzen River.
Burrowing owl	On north coast, a locally rare migrant and winter visitor. No nesting records for the region, or observations in Plan Area.
Vaux's swift	A common summer resident and breeder; casual in winter. Commonly seen in suitable habitat in the Plan Area; detected in late successional habitat in multi-species study. Known from all areas where snags and large hollow trees are found.
Pileated woodpecker	A rare to uncommon resident and breeder. Observed in Plan Area in Bear-Mattole, Eel, and Humboldt watersheds; probably more widespread as anecdotal observations attest.
Purple martin	An uncommon summer resident and breeder. In north coast region, most commonly observed on the coastal lowlands near river mouths. Infrequent incidental observations indicate they are present, but possibly in very low numbers. PALCO observations are from the Bear-Mattole watershed.
Bank swallow	On north coast, considered a rare migrant and locally rare breeder. No nesting colonies are known on or near the PALCO ownership.
Yellow warbler	In north coast region, a locally common summer resident and breeder; common migrant; and casual in winter. Infrequent incidental sightings on PALCO lands, generally along Eel River and some of its large tributaries. Nests likely to be infrequently distributed in suitable habitat.
Yellow-breasted chat	In north coast region, a locally uncommon to common summer resident and breeder; and accidental in winter. Infrequent incidental sightings on PALCO lands, generally in Eel River watershed. A low level of nesting likely occurs in suitable habitat.
California red tree vole	Widespread in the Plan Area.
Humboldt marten	No records of occurrence in Plan Area; presumed to be very rare or absent. Trapping records for bio-region indicate martens were once more common.
Pacific fisher	Detected in the Plan Area in the multi-species study in the Yager and Humboldt watersheds.

- Vertebrate species known or assumed to occur in the Plan Area were grouped into habitat-based guilds;
- The need of certain wildlife species for snags, downed logs, live wildlife trees, and hardwoods was analyzed; and
- Stream habitat conditions were assessed based on data from existing programs and studies conducted for this Plan.

a. CWHR Classification

The CWHR system characterizes vegetation by species, size, and density components. Overstory vegetation was used to determine the CWHR vegetation type, and CWHR species classification was based on the percent crown closure by species in all size classes greater than or equal to the CWHR size class. Size class determination is based on the quadratic mean diameter of the trees (i.e., the diameter of a tree of average basal area [BA]). Part B in Volume III provides additional information about CWHR types and CWHR standards for tree size and canopy closure. Part C in Volume III includes tables indicating estimated acres of each CWHR type in the Plan Area.

b. Analysis of Multi-Species Data

As described in Part K of Volume II, the multi-species monitoring program was conducted over a three-year period (1995-1997). Data were collected on vegetation and animals on 109 plots in 1995, 76 plots in 1996, and 83 plots in 1997. Map 17 in Volume V shows the location of the plots. Table 7 indicates the three-year totals for number of animal and plant species observed in each forest seral type. In general, the results show no clear dominance between seral types in the overall number of animal species observed. Each seral stage appears to provide a series of habitats supporting a somewhat unique assemblage of species, and no seral stage provides the single most important habitat for the area's vertebrate species.

Table 7
Animal and Plant Species Richness by Seral Type

Seral Type	Animal Species	Plant Species
Forest Openings	72	88
Young Forests	127	130
Mid Successional	112	122
Late Successional	116	130
Montane Hardwood	76	98
Perennial Grassland	64	62

c. Habitat-based Guilds

Data from the 1995 monitoring plots were analyzed in an attempt to group vertebrate species associated with the Plan Area into habitat-based guilds. The formulation of the guilds entailed two independent analyses. The first was an analysis of the 1995 monitoring plot data to examine how species were grouped based on sample plots they either shared or mutually avoided. The second analysis examined scientific literature for evidence of habitat versatility for the species observed in the monitoring program and applied the results to other species that were not observed but have the potential to occur on PALCO lands. High-versatility species were classified as generalists, and medium- and low-versatility species were organized into seven groups related to PALCO's forest seral types. This effort resulted in two guilds with few species (grassland, old growth), two intermediate-sized guilds (hardwood, shrub/forest opening/young seral), and three comparatively large guilds (generalists, mid seral/late seral/old growth, riparian forest and shrub). Part L of Volume II includes the report on the analysis, together with the list of species assigned to each guild. In a separate but related task, NRM grouped the plant species associated with the bio-region into habitat-based guilds comparable to those for the wildlife species.

d. Structural Components of Wildlife Habitat

In connection with the multi-species monitoring program and preparation of this Plan, PALCO initiated a study of the structural components of wildlife habitat. Specifically, the study focused on the need of various species for snags, downed logs, live wildlife trees, and hardwoods. As described in Part M of Volume II, there is an abundance of existing literature supporting the importance of structural components to wildlife abundance and diversity. Unfortunately, most of the available information has not been generated through study of the redwood/Douglas-fir region. To bridge this gap, PALCO collected data on snags in 139 plots studied as part of the multi-species study, analyzed the inventory database regarding the hardwood component within conifer stands, and reviewed the available literature. Based on the results, retention and recruitment measures were developed as part of the terrestrial habitat conservation strategy in this Plan.

e. Stream Habitat Conditions

Stream habitat conditions in the Plan Area are known primarily from data collected from stream monitoring, assessment, and enhancement programs conducted by PALCO and CDFG and a stream habitat assessment conducted by PALCO and R2 Resources, Inc. (R2).

1) Stream Monitoring, Assessment, and Enhancement

PALCO has conducted an extensive stream monitoring program for the past three years, collecting data on aquatic macroinvertebrates, fine sediments, substrate size, and crown cover at 52 permanent stations. Additional stations may be added in the future as discussed in the Aquatic Species Conservation Plan in Volume IV. At a subset of these stations, PALCO also measures continuous temperature and surveys the stream bed. The location of the monitoring stations is shown on Map 18 in Volume V; monitoring results are provided in Part F of Volume II, with the information organized by WAA, hydrologic unit, planning watershed, and monitored stream.

CDFG's Inland Fisheries Division maintains 12 permanent monitoring stations on PALCO property. In addition, CDFG has conducted assessments of approximately 207 miles of streams on PALCO lands. Map 18 shows the assessed streams; data collected in the assessments include total feet, percent pools, pools per mile, backwater pools per mile, mean pool depth, maximum pool depth, residual pool volume, percent canopy cover, and embeddedness.

In addition to the monitoring and assessment efforts, 979 stream enhancement projects have been undertaken since 1987. These include 247 access improvements, 583 bank stabilization structures, and 149 instream channel enhancements. Map 19 in Volume V shows the location of these projects. Part G in Volume II includes a comprehensive list of projects, together with information about whether the improvement is functioning or failed and the amount and sources for funding for each project.

2) Stream Habitat Assessment

The assessment conducted by PALCO and R2 provides a landscape-level analysis of conditions in each WAA. Fifteen habitat variables were examined to determine either current conditions within streams or to assess the likely effects of timber management activities on aquatic resources. Data originating from CDFG's stream habitat and large woody debris (LWD) databases were used to determine average conditions in each of the five WAAs. Monitoring data were used to determine where conditions exceeded thresholds that PALCO believed to be deleterious to fish. Results of the analysis indicate a wide range of habitat conditions within and among WAAs. Detecting differences among groups was difficult in some cases because of high variability in the values observed within the groups being compared. Average values for each stream habitat variable in each WAA are presented in Table 8, together with the numeric criteria used to define good and poor conditions.

Areas of concern identified in each WAA are as follows:

- **Humboldt Bay WAA**: Shallow mean pool depth, high level of fine sediment <0.84 mm, and low instream cover levels.

- **Yager WAA**: Low percent canopy, and low instream cover levels.

- **Van Duzen WAA**: Low percent pools, low instream cover levels, and high level of fine sediment <0.84mm and < 4.7mm.

- **Eel WAA**: High water temperatures, low instream cover levels, and low LWD abundance.

- **Bear-Mattole WAA**: High embeddedness, low percent canopy, low percent pools, low instream cover levels, and high water temperatures.

Table 8
Average Values for Stream Habitat Variables[1]

Habitat Variable	Criteria[2]	Humboldt Bay	Yager	Van Duzen	Eel	Bear-Mattole
Mean Pool Depth (ft)	>2.0 ft/<1.0 ft	0.85 (5)	1.67 (1)	1.2 (3)	1.19 (4)	1.27 (2)
Maximum Pool Depth (ft)	>3.0 ft/<2.0 ft	2.11 (5)	2.96 (1)	2.3 (3)	2.24 (4)	2.34 (2)
Residual Pool Volume (ft^3)	>600 ft^3/<200 ft^3	360 (5)	1810 (1)	511 (3)	876 (2)	363 (4)
Embeddedness Score[3]	<1.75/>3.25	2.61 (3)	2.51 (1)	2.54 (2)	2.71 (4)	2.91 (5)
Percent Fines (<4.7 mm) (%)	<20%/>50%	26.6 (1)	36.4 (3)	43.4 (5)	39.7 (4)	35.3 (2)
Percent Fines (<0.85 mm) (%)	<20%/>30%	26.6 (4)	16.6 (1)	29.0 (5)	23.8 (3)	18.3 (2)
Percent Canopy Cover (%)	70-100%/<45%	76.1 (1)	50 (4)	68 (2)	54 (3)	15 (5)
Percent Pools (%)	>40%/<25%	45 (1)	22 (3)	14 (5)	23 (2)	15 (4)
Percent Instream Cover (%)	>40%/<20%	17 (3)	20 (1)	17 (3)	17 (3)	11 (5)
Percent Gravel Dominance (%)	>50%/<20%	35 (5)	45 (1)	38 (3)	41 (2)	33 (4)
LWD (pieces/100 ft)	ND[4]	5.5 (2)	5.6 (1)	ND[4]	1.3 (3)	ND[4]
Maximum Weekly Average Temperature (MWAT)	≤18.4°C/>18.4^{0}C	15.6 (2)	16.1 (3)	15.4 (1)	17.1 (4)	18.3 (5)
D50 (mm)	ND[4]	57 (5)	93 (1)	60 (4)	88 (2)	64 (3)

[1] Values within parentheses represent the rank with 1 being the best observed and 5 the worst.
[2] These values indicate the criteria for good and poor habitat conditions, respectively.
[3] Measured using nonstandard methodology.
[4] Indicates no data or criteria available for this variable.

8. Water and Air Quality

Beneficial uses for water from PALCO lands includes fish production and some downstream domestic uses. Water quality data relevant to these uses were collected as part of the macroinvertebrate sampling component of the stream monitoring program (see Volume II). Both instream data and indices developed from invertebrate collections (i.e., the Hilsenhoff index, Simpson diversity index, and species richness) indicate that water quality ranges from excellent to average in the WAAs.

Air quality in the region generally is good. A primary risk to air quality is smoke from wildfires, slash burning, and agricultural burning. PALCO currently participates in a cooperative program with the North Coast Unified Air Quality Management District, CDF, and other landowners to reduce the impacts of smoke on populated areas by coordinating burns and monitoring weather conditions.

E. LTSY Projections

Long term sustained yield is defined in the FPRs as the average annual growth sustainable by the inventory predicted at the end of a 100-year planning period. The predicted LTSY is a control on harvest rates in that the FPRs limit the amount of harvest in any 10 year period to no more than 10 times the LTSY.

The LTSY projection in this Plan is based on PALCO's inventory as of January 1, 1998 and covers a 120-year period—January 1, 1998 to January 1, 2118. Harvest, growth, and inventory are projected in 10-year periods that begin on January 1, 1998. If the Plan is approved in 1999, then the first period will be a nine-year period. The "decade" statistics provided in this section will, therefore, need to be adjusted to account for this "delay." This is a standard modeling adjustment and does not change the results in any material way.

1. Model and Assumptions

The LTSY projection in this Plan was prepared by VESTRA Resources, Inc. Part B of Volume III described the planning and modeling process in detail. Key components and assumptions are summarized here.

a. GIS Database

PALCO's comprehensive GIS and related resource inventory databases are the foundation for the LTSY projection. In particular, PALCO's vegetation inventory has special importance because it is the basis for several other GIS data layers and must meet the accuracy standards specified by CDF. PALCO has maintained a GIS database of vegetation types on its lands since 1986, when Hammon Jensen Wallen and Associates (HJW) prepared a property-wide inventory based on 1:12,000-scale aerial photographs of conditions in 1985 (see Part E in Volume III for description of HJW procedures and assumptions). Based on a stratified sample of plots, the confidence interval on the total volume estimate is 2.4% at the 95% confidence level. Limitations of the inventory include its relative lack of information about small tree (less than 8" DBH) and non-tree flora. To better understand these vegetation information limitations, PALCO included a vegetation component in the multi-species monitoring program (see Part K in Volume II). All vegetation on 109 plots was measured to improve PALCO's database on the number and types of plants on the property. Based on the data collected, PALCO also was able to insert a small tree and hardwood component into its stand tables, allowing PALCO to better predict ingrowth and CWHR types.

In addition to the vegetation inventory, the following data layers were used to create the land-type polygons for the LTSY projection: ownership boundary, site quality, WAAs, active THPs, slope classes, stream buffers, marbled murrelet and northern spotted owl habitat, and special treatment areas.

b. Silvicultural Prescriptions

Approximately 170 silvicultural prescriptions were considered in the model, with each prescription consisting of a combination of silvicultural treatments applied in specific decades. In the model, the prescriptions are grouped into the 29 regimes that begin in different decades. The full range of possible silvicultural prescriptions were applied to all timberlands, except in WLPZs, active THP areas, and areas with special limitations. Prescriptions for Class I and II WLPZs were determined based on the measures identified in the Agreement in Principle and Aquatic Species Conservation Plan. In active THP areas, one of seven sets of prescriptions was applied.

c. Economic Parameters

Economic parameters for the model include gross revenue, silvicultural cost, and harvesting cost. Present net worth, or discounted cash flow from each silvicultural prescription, was calculated; and a discounting factor of 6% was applied to each harvest value. Maximization of present net worth was used as the objective function in a linear programming model. Trees were valued by size based on the value of recovered lumber. The data used in calculating costs and revenues are proprietary and confidential and, if requested, will be made available to CDF for confidential audit. In addition to the above parameters, two economic-related objectives were identified by PALCO:

1. Between decades, maximum harvest levels will not increase or decrease by more than 15% between the first and second decade, 12.5% between the second and third decade and 10% thereafter; and

2. Harvests per decade must be less than LTSY, with average growth computed as the mean annual periodic increment of the last four planning periods for uneven-aged prescriptions and as the mean annual increment for even-aged prescriptions.

These objectives were set to ensure a stable flow of products and revenues to maintain the regional economic vitality and to ensure that PALCO lands attain maximum sustainable production.

d. FREIGHTS Growth Estimate

Growth of redwood and Douglas-fir forests on PALCO's ownership was projected over the 120-year period using the FREIGHTS model, which is similar to CRYPTOS but with two enhancements: 1) projection of sprout and seedling growth, and 2) better long-term growth control. LTSY calculations were made as recommended by Dr. Lawrence S. Davis. Part D in Volume III describes how the FREIGHTS model was calibrated to match volume estimates for redwood stands on PALCO lands.

e. Accuracy of the Growth Prediction

Accuracy of the growth predictions is addressed in VESTRA's report (Part B of Volume III). In addition, independent evaluation of the methods used were provided by Dr. Greg S. Biging and Dr. Davis (see Part F in Volume III). Dr. Biging concluded that the procedures chosen by VESTRA were reasonably selected and the projections appear to be conservative (i.e., actual growth is expected to surpass the projection); he also recommended ways to improve the overall accuracy of the projections. Dr. Davis provided a letter on the accuracy and credibility of the analytical model used in the projections.

f. Conservation Parameters

In addition to the above considerations, PALCO identified the following conservation parameters for the LTSY projections:

1. PALCO timberlands in each WAA should include at least 5% forest opening, 5% young forest, 5% mid-successional, and 10% late seral forest at all points in the Plan period (excluding WAA6);

2. During the first two decades of SYP implementation, harvesting of old growth should be phased;

3. Throughout the Plan period, at least 10% of PALCO timberlands in each WAA (excluding WAA 6) should be suitable nesting habitat for northern spotted owls;

4. The DI for PALCO lands in each WAA (excluding WAA 6) should not exceed 20% at any point in the Plan period;

5. WLPZs should average 170' slope width along Class I streams and 100' slope width along Class II streams;

6. Harvests within 30' of Class I streams and 10' of Class II streams should be limited to treatments that will enhance (or, if the riparian system is not impaired, maintain) riparian conditions; and

7. Harvests in the 30' to 100' buffer of Class I streams will have a dense late seral selection prescription applied (i.e., minimum basal area of 300 sq. ft./acre with size retention standards).

8. Harvests in the 100' to 170' buffer of Class I streams and in the 10' to 100' buffer of Class II streams should be limited to the regular late seral prescription (i.e., minimum basal area of 240 sq. ft./acre with size retention standards). Only single tree selection harvest methods should be used in these buffer areas.

9. Harvest within 300 feet of suitable marbled murrelet habitat on adjacent public lands should be limited to the regular late seral prescription (i.e., selection harvest every 20 years, 240 sq. ft./acre stand retention after).

2. Projections

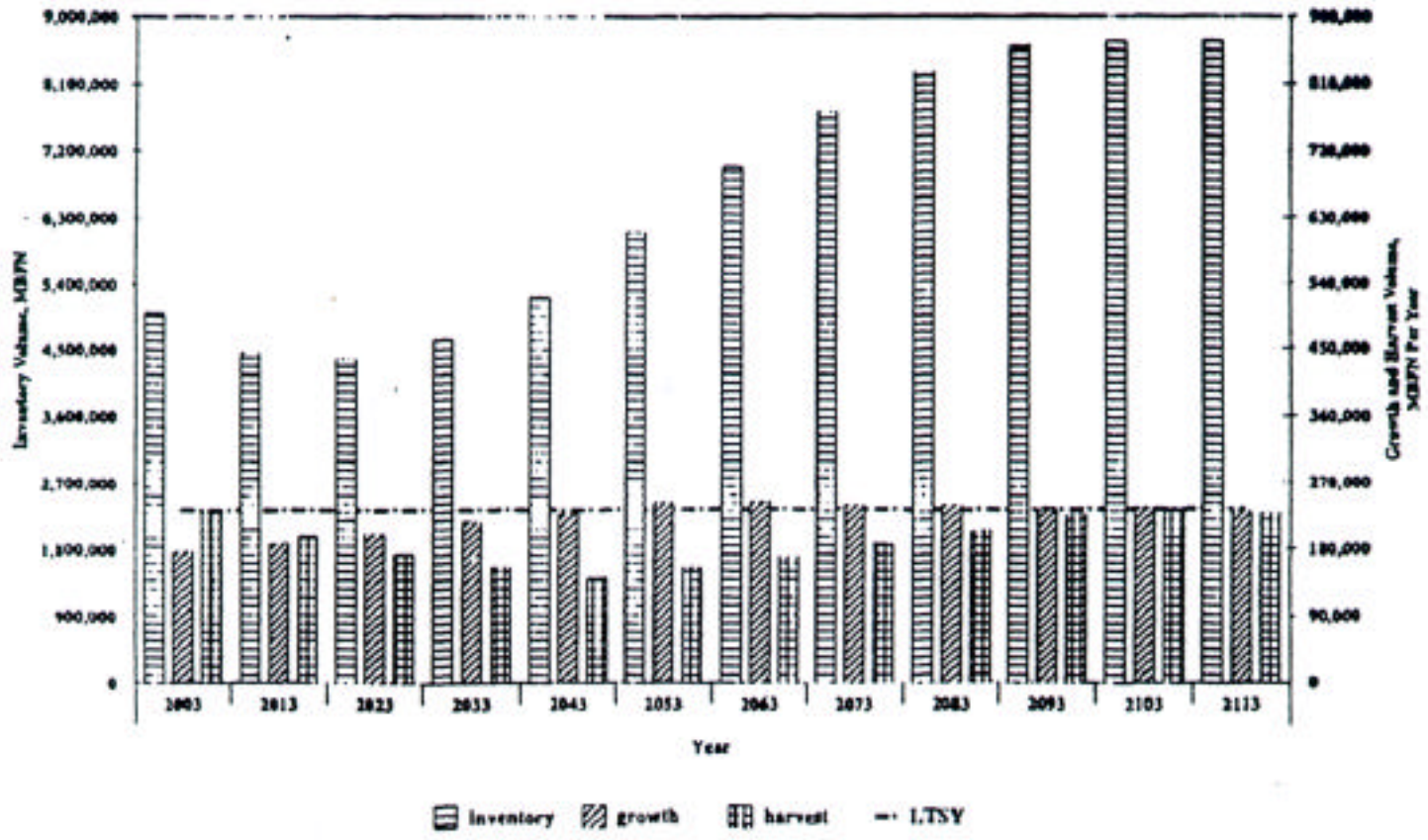
Data and graphs produced in connection with the LTSY projects are included in Part C of Volume III. Key results are presented here.

a. Inventory, Growth, and Harvest Volumes

Table 9 and Figure 1 summarize the LTSY projections in ten year increments. LTSY volumes are set at 233,520 thousand board feet net (MBFN) per year, which equals 1,103 board feet net (BFN) per acre per year. Annual harvest levels in the first decade are estimated at approximately 233,520 MBFN. The location of the projected harvests for the first decade and the location of existing THP areas are shown on Map 20.

Table 9 Inventory, Growth, and Harvest per Decade			
Decade	**Inventory MBFN**	**Growth MBFN/Decade**	**Harvest MBFN/Decade**
1	5,004,554	177,465	233,519
2	4,453,995	188,200	198,491
3	4,355,315	201,283	173,680
4	4,632,062	216,883	156,312
5	5,224,017	227,967	140,681
6	6,105,130	243,265	154,749
7	6,991,135	243,891	170,224
8	7,713,918	240,116	187,246
9	8,259,261	240,312	205,970
10	8,596,446	233,607	226,567
11	8,661,314	233,372	233,519
12	8,670,639	230,373	227,291

Figure 1
Inventory, Growth, and Harvest per Decade



b. Projected Seral Types on PALCO Lands

Table 10 presents the LTSY projections of seral types on PALCO lands by WAA. Figure 2 shows changes in seral types over the period for all PALCO lands. Graphs showing changes on PALCO lands by WAA are included in Part C of Volume III; Maps 21-24 in Volume V illustrate the distribution of seral types at 10, 35, 65, and 105 years into the plan period.

Tables 11 and 12 present the LTSY projections of seral types within Class I and II WLPZs (also see graphs of data in Volume III Part C and illustrations of stand development within Class I and II buffers in each decade of the plan period in Volume V).

F. Potential Effects and Alternatives

For SYP and HCP purposes, PALCO considered whether problems identified as part of baseline conditions would be exacerbated by operations under the LTSY projections and if potentially significant adverse effects would result. Other impacts considered include effects on employment, rangeland, public recreation areas, scenic views and aesthetics, water quality, and air quality. This assessment was conducted to establish the scope and type of measures and alternatives necessary to avoid or mitigate significant adverse impacts. The NEPA and CEQA documentation being prepared for the agencies' actions will provide detailed, independent analysis of potential effects, proposed mitigation, and alternatives.

1. Potential Impacts of Concern

Based on existing conditions and projected activities over the Plan period, potential impacts of concern have been grouped into five categories: effects on terrestrial habitats, effects on aquatic habitats, effects on Covered Species, Effects on List B Species, and Other Effects.

a. Effects on Terrestrial Habitats

With regard to effects on terrestrial habitats, the impacts of concern include changes in the amount and mix of seral types; reduction in redwood and Douglas-fir old growth; and potential loss of structural components of wildlife habitat.

1) Changes in Amount and Mix of Seral Types

As shown in Table 10 and Figure 2, the greatest change in seral type mix would occur in the first two decades. In that period, the amount of late seral and old growth types would substantially decrease from current levels and the amount of forest opening and young forest would substantially increase. However, in each decade in each WAA, late seral habitat would constitute at least 10% of the total habitat; and property-wide, the amount of late seral would begin to increase in the fourth decade. No change in the amount of prairie habitat on prairie soils is projected; however, grasslands on forest soils may be converted back to conifer types. Acres of hardwood stands would be reduced, with the greatest decrease occurring over the first three decades. To reduce adverse effects from these changes, PALCO proposes to maintain a mix of seral types within each WAA over time; preserve late seral and old growth types within MMCAs and RMZs, and conserve hardwoods as a structural component of wildlife habitat.

Table 10
Projected Forest Seral Types for the Plan Area by Decade for the Plan Period
(acres)

	Decade												
Seral Type	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Forest Opening	12,616	30,615	38,175	31,269	31,879	23,179	16,012	19,226	18,460	25,590	28,921	24,091	21,732
Young Forest	38,502	54,062	67,115	74,443	67,661	58,066	66,199	52,453	41,725	49,407	45,546	55,857	58,575
Mid-successional	87,772	80,499	75,468	76,050	81,315	99,298	96,027	102,205	113,422	94,645	98,576	85,214	77,030
Late Seral	53,236	32,433	18,105	17,710	18,793	19,129	20,973	25,442	25,743	29,675	26,191	34,010	41,886
Old Growth	6,444	3,864	3,564	3,295	2,983	2,965	2,136	2,136	2,136	2,136	2,136	2,136	2,136
Hardwood	4,266	1,362	409	68	204	198	1,489	1,373	1,350	1,382	1,465	1,528	1,477
Prairie	3,832	3,832	3,832	3,832	3,832	3,832	3,832	3,832	3,832	3,832	3,832	3,832	3,832
Non-timber	5,038	5,038	5,038	5,038	5,038	5,038	5,038	5,038	5,038	5,038	5,038	5,038	5,038

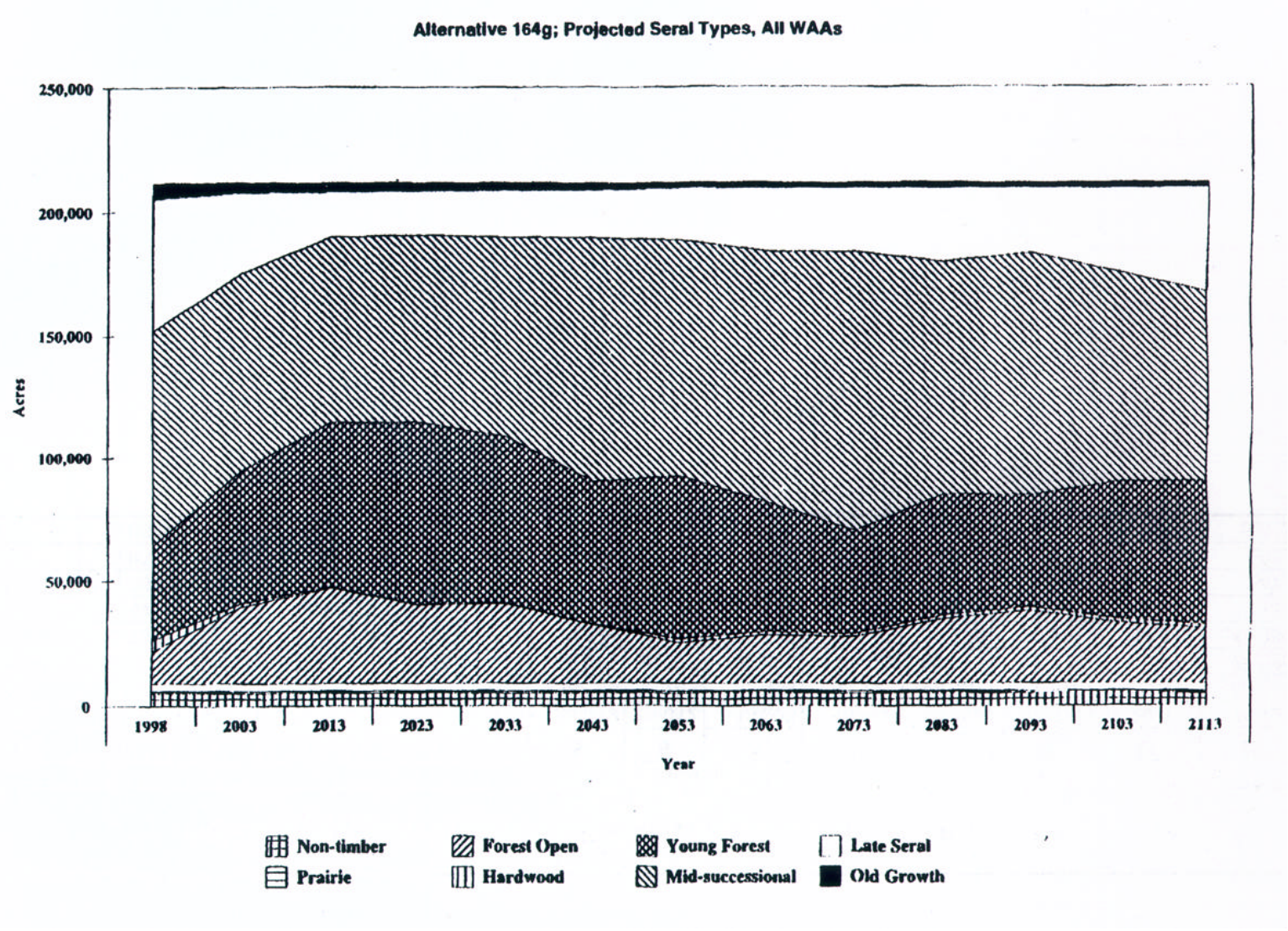
Table 11
Projected Forest Seral Types in Class I WLPZs by Decade for the Plan Period
(acres)

	Decade												
Seral Type	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Non-timber	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018	1,018
Prairie	96	96	96	96	96	96	96	96	96	96	96	96	96
Forest Opening	294	1	1	1	1	1	1	32	5	13	1	1	1
Hardwood	230	147	31	17	57	57	60	58	60	172	187	202	200
Young Forest	1,375	1,858	1,225	399	124	60	103	70	259	272	80	19	9
Mid-successional	4,433	4,503	4,983	5,750	5,451	5,240	4,390	3,359	2,417	2,384	2,100	2,167	2,434
Late Seral	3,133	3,064	3,435	3,520	4,069	4,355	5,158	6,194	6,972	6,871	7,344	7,324	7,069
Old Growth	505	398	296	285	268	258	258	258	258	258	258	258	258
Total	11,085	11,085	11,085	11,085	11,085	11,085	11,085	11,085	11,085	11,085	11,085	11,085	11,085

Table 12
Projected Forest Seral Types in Class II WLPZs by Decade for the Plan Period
(acres)

	Decade												
Seral Type	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Non-timber	342	342	342	342	342	342	342	342	342	342	342	342	342
Prairie	105	105	105	105	105	105	105	105	105	105	105	105	105
Forest Opening	415	1	1	1	1	1	1	22	4	9	1	1	1
Hardwood	366	288	73	13	6	5	65	45	48	164	222	225	221
Young Forest	2,467	3,068	2,040	819	312	122	126	101	456	349	126	40	21
Mid-successional	7,834	8,047	8,632	9,788	9,024	8,541	6,583	4,630	3,672	3,365	3,244	2,988	2,811
Late Seral	4,667	4,475	5,331	5,477	6,756	7,438	9,332	11,310	11,928	12,220	12,514	12,854	13,054
Old Growth	670	540	343	322	321	312	312	312	312	312	312	312	312
Total	16,866	16,866	16,866	16,866	16,866	16,866	16,866	16,866	16,866	16,866	16,866	16,866	16,866

Figure 2
Projected Forest Seral Types for the Plan Area by Decade



PALCO also considered changes in late seral and old-growth types within WLPZs. The prediction of seral types in Class I WLPZs shows a phased reduction of old growth, retention of some old growth throughout the Plan period, and steady increases in late seral types property-wide. Within individual WAAs, the changes in old growth and late seral types vary. In Class II WLPZs, old growth reduction is phased, some old growth is retained over time, and steady increase in late seral types occur property-wide. Impact avoidance and mitigation measures are addressed under “2. Effects on Aquatic Habitat” below.

2) Reduction in Old Growth

The FPRs do not distinguish old growth forests as a unique type apart from late successional forests, and, with the possible exception of the marbled murrelet, it is not scientifically clear that any species of fauna associated with late successional forest is obligated to old growth. This Plan identifies and addresses old growth habitats because of the significant public interest in these forest types. Effects from the overall reduction in old growth redwood and Douglas-fir were considered.

Over the life of the Plan (120 years), old growth will be reduced in the Plan Area and will not be replaced within the Plan period. However, the amount of late seral habitat in the Plan Area will increase over the period; the amount of old growth in the bio-region also potentially would increase. Potential adverse effects from the reduction in old growth will be minimized and mitigated primarily by the conservation of old growth and buffer areas under the Headwaters Agreement and within the MMCAs, together with the implementation of the RMZ measures identified in this Plan. In addition, PALCO will phase harvesting of old growth during the first two decades of Plan implementation.

Regarding Douglas-fir old growth, maps provided in this Plan show the current and projected distribution of seral stages (see Maps 5, 21, 22, 23, and 24 in Volume V). These maps reveal that old growth Douglas-fir stands, which principally occur along the western edge of PALCO's property in the Bear-Mattole WAA, are conserved on a long-term basis throughout the Plan period. (Data tables in the "LTSY Data and Graphs" section contain the acreage figures associated with the seral stages shown on these maps.) Also, the retention requirements associated with RMZs ensure that old growth Douglas-fir trees will be conserved on a long-term basis wherever they occur on the ownership. Approximately 13 percent of the ownership falls within a Class I or Class II WLPZ (see Table 5). In addition to existing old growth Douglas-fir, these zones contain many young growth Douglas-fir trees that over the Plan period will develop and eventually attain the age, size, and characteristics commonly associated with old growth trees. Given the retention and recruitment of old growth Douglas-fir that will occur under the Plan, the projected reduction in old growth Douglas-fir would not result in significant adverse effects.

3) Loss of Wildlife Habitat Structural Components

As previously identified, the potential loss of structural components required by certain wildlife species is a concern under baseline conditions as well as under the LTSY. To reduce the immediate and long-term effects of such losses, PALCO proposes to retain and recruit structural components of wildlife habitat through measures implemented as part of timber management (see section “G. SYP/HCP Measures”).

b. Effects on Aquatic Habitats

With regard to effects on aquatic habitats, timber operations under the LTSY projections have the potential to exacerbate the four problems identified in the assessment of baseline conditions:

- Excessive sediment delivery into streams;
- High water temperature;
- Low levels of instream LWD; and
- Limited potential for LWD recruitment and related conditions in RMZs.

To reduce, mitigate, and monitor such impacts, PALCO proposes to implement all of the measures developed as part of the Aquatics Species Conservation Plan, including the interim measures identified in the Agreement in Principle.

c. Effects on Covered Species

In assessing effects on Covered Species, PALCO assumed that any adverse impact on already listed species is potentially significant and would have to be mitigated to the satisfaction of the responsible agencies. In addition, all Covered Species were treated as if they were currently listed. Table 13 provides a summary of potential impacts to each Covered Species. Impact avoidance and mitigation measures are proposed in the HCPs in Volume IV.

d. Effects on List B Species

No incidental take of endangered or threatened species on List B would occur, unless authorized through amendments to the Plan and ITPs at a later date. Adverse effects to listed and unlisted species would be avoided and mitigated primarily through the measures for List A species. A species-by-species consideration of impacts and mitigation is provided in HCPs in Volume IV.

e. Other Effects

1) Recreation Lands

Future operations are not expected to alter recreational uses on the property and would not adversely affect public access to recreation facilities on public lands. Some aspects of management will entail monitoring of sites in Humboldt Redwoods State Park; however, the measures would not alter the designated use of those lands.

2) Forage and Range Lands

Future management will not preclude continued grazing uses on the property. Impacts to Covered Species from continued grazing would be mitigated by the measures incorporated in this Plan.

3) Scenic Views and Aesthetics

PALCO's lands are part of the forested landscape that is valued in the north coast for its aesthetics as well its economic and environmental resources. Future harvesting and growth patterns will alter the current mosaic of stands, but no significant adverse change will occur to general scenic views. Harvesting like that proposed in the Plan has been part of the landscape in Humboldt County for over 150 years. Visual impacts along public roads, wild and scenic rivers, and parks would continue to be buffered as required under state law.

Table 13 Summary of Potential Impacts to Covered Species	
Focus Species	
Marbled murrelet	Potential effects include a 17-23% reduction in potential or actual nesting habitat in the Plan Area and possible disruption of nesting, and (under worst case assumptions) possible killing or injurying of murrelets. Portions of the Plan Area (approximately 30,000 acres) have been designated "critical habitat" for the murrelet populations in California.
Northern spotted owl	Displacement of owls due to habitat modification is the primary impact of concern. Injury to or death of owls also could occur but is considered less likely than displacement. Other potential impacts considered include the potential effects of forest fragmentation; the loss of management options; possible increases in predation and competition; and the added risk of harm due to natural occurrences.
Chinook salmon	Potential impacts include reductions in deep water adult holding habitat, loss of suitable spawning gravels associated with sediment inputs from roads and harvest areas, and changes in channel morphology associated with past harvest in riparian areas that destabilized banks and eliminated instream LWD. Management-related sediment inputs also may reduce survival of fish eggs and fry. Operation of PALCO's fish rearing facilities entails collection of the species.
Coho salmon	Potential impacts include reduction in deep water habitat and associated cover, increased water temperatures and fine sediment levels, and loss of suitable spawning gravel and rearing habitat. Impacts may occur because of elevated water temperatures and fine sediment levels resulting from past harvests, and erosion from roads and hillsides. Impacts may also occur during instream construction (e.g., road crossing construction), and summer monitoring/scientific surveys. Operation of PALCO's fish rearing facilities may entail inadvertent collection of the species. The area currently proposed by NMFS as critical habitat for coho salmon encompasses PALCO's ownership.
Cutthroat trout	Potential impacts include reduction in deep water adult holding habitat, increased fine sediment, and loss of suitable spawning gravels. Impacts could result from elevated water temperatures and fine sediment levels resulting from past riparian harvest, and erosion from road and hillsides, respectively. Impacts may also occur during instream construction (e.g., road crossing construction), and summer monitoring/scientific surveys.
Steelhead trout	Potential impacts include reduction in instream cover, increased water temperature and fine sediment, and loss of suitable spawning gravel. Impacts for this species is similar to that for coho, potentially resulting from elevated water temperatures and fine sediment levels resulting from past riparian harvest, and erosion from road and hillsides, respectively. Impacts may also occur during instream construction (e.g., road crossing construction), and summer monitoring/scientific surveys. Operation of PALCO's fish rearing facilities entails collection of the species.
Other List A Species	
Pacific lamprey	Potential impacts include loss of suitable spawning gravels associated with sediment inputs from roads and harvest areas, and as a consequence of reduced LWD inputs. Management-related sediment inputs may result in take through reductions in survival of eggs and recently hatched larvae.
Southern torrent salamander	Logging, road construction, and livestock grazing have a low potential for adverse habitat modification. Road construction activities, especially crossings of headwall seeps or springs can cause indirect impacts via habitat modifications. Surveys or monitoring which include collection of individuals could also involve a low level of direct mortality.
Foothill yellow-legged frog	Potential impacts include those from river bar gravel operations, livestock grazing, near stream harvest, instream habitat projects, and surveys or monitoring of this frog. The presence of equipment or animals on river bars could potentially impact adults or larvae. Changes in water quality could similarly cause adverse impacts. No habitat alteration is planned which would render habitat unsuitable for this species.
Table 13 (Continued) **Summary of Potential Impacts to Covered Species**	
Red-legged frog	Potential impacts include habitat modification due to logging, siltation of breeding habitat, deterioration of habitat due to grazing, increased potential for predation by fish and introduced bullfrogs, and possible harm from use of herbicides and pesticides.

Tailed frog	Potential impacts include habitat modification due to logging and livestock grazing The larvae may be especially vulnerable to sedimentation, higher flows, and other potential impacts prior to their transformation into adults. Surveys or monitoring which include collection of individuals could also involve a low level of direct mortality.
Northwestern pond turtle	Potential impacts include possible death or injury and habitat modification due to gravel and rock extraction, timber management, road construction, grazing, and scientific surveys and studies.
Double-crested cormorant	Potential impacts include indirect effects from timber management and gravel and rock extraction. No death or injury to this species is anticipated because it currently does not nest inland. There is low potential that harvests affect perch trees along river corridors and that gravel operations may prevent cormorants from foraging in limited areas.
Great blue heron	Potential impacts include possible harvest of nest trees and alteration of foraging habits or locations due to gravel operations.
Great egret	Potential impacts include possible removal of perch sites and disturbance at foraging areas due to timber management activities and gravel and rock extraction operations. The potential for adverse impacts is low because this species does not currently appear to nest or forage in areas where such operations do or might occur.
Black-crowned night heron	Potential impacts include possible removal of nest trees or other habitat habitat modification due to timber management. The possibility of adverse impacts is extremely low given the apparent absence of the species in potential harvest areas.
Snowy egret	Although no observations of this species have been recorded on PALCO lands, there is the possibility that breeding or foraging activities could occur on the inland rivers at some future time. If this occurs, potential impacts would include possible removal of perch or nest trees due to timber management and modification of foraging habitat due to gravel extraction.
Osprey	Potential impacts include nest disturbance or harvest of inactive or unknown nest trees.
Bald eagle	Potential impacts include disturbance of foraging activities of wintering eagles due to logging activities and gravel extraction. Direct harm due to collisions with cable lines or other equipment also is possible. If a bald eagle nest occurs on the ownership in the future, logging activities at or near the nest site could disrupt nesting or result in death or injury to individual birds and/or eggs.
Sharp-shinned hawk	Potential impacts include habitat modification and disturbance of undetected nest sites due to logging activities. The potential for impacts is low given the apparent low level of nesting in the Plan Area.
Cooper's hawk	Potential impacts include habitat modification and disturbance of undetected nest sites due to logging activities.
Northern goshawk	Potential impacts include habitat modification and disturbance of undetected nest sites due to logging activities.
Ferruginous hawk	Potential impacts include disruption of winter foraging activities due to logging activities. The potential for this impact is quite low, given the very low numbers of birds in the Plan Area and the fact that the foraging habitat does not overlap potential harvesting areas.
Golden eagle	Potential impacts include removal of nest trees and disturbance of nest sites due to logging activities.
American peregrine falcon	There have been numerous consultations with CDFG regarding a known nest site. Due to the location and aspect of the nest cliff, potential impacts due to logging activity are confined to noise disturbance. The potential for disturbance due to gravel operations is very low.
Table 13 (Continued) Summary of Potential Impacts to Covered Species	
Western snowy plover	Potential impacts include nest disturbance due to off-road vehicle use, gravel extraction, other gravel bar use, or livestock grazing along river corridors.
Burrowing owl	Potential impacts include removal of nest sites due to road building through prairie habitats as part of logging activities or due to livestock grazing.
Vaux's swift	Potential impacts include loss of nesting habitat due to removal of old, decadent redwoods and Douglas-firs with hollow snag-tops and nest disturbance due to logging activities.
Pileated woodpecker	Potential impacts include adverse habitat modification and/or removal of undetected nest sites due to snag removal.

Purple martin	Potential impacts include loss of nesting habitat due to the removal of old, decadent redwoods and Douglas-firs with hollow snag-tops. Given the bird's rarity in the Plan Area, the potential for adverse impacts is highly unlikely.
Bank swallow	Potential impacts include possible displacement and habitat modification due to road construction, improvement, or maintenance. The potential for adverse impacts is considered extremely low.
Yellow warbler	Potential impacts include displacement and habitat modification or degradation due to timber management,, gravel extraction, and livestock grazing. There is a low potential for adverse impacts.
Yellow-breasted chat	Potential impacts include displacement and habitat modification or degradation due to timber management,, gravel extraction, and livestock grazing.
California red tree vole	Potential impacts include reduction and fragmentation of habitat due to logging, fires, construction of roads, and other activities creating forest openings. Harvest of nest trees also is possible. Some permitted scientific collection of individuals has occurred through pit-trapping as part of multi-species surveys for this species.
Humboldt marten	Potential impacts include reduction of suitable habitat due to removal of snags, downed logs, or large wildlife trees.
Pacific fisher	Potential impacts include reduction of suitable habitat due to removal of large snags and downed logs and increased competition from other species. Conversion of hardwood stands to homogeneous stands of Douglas-fir also may be detrimental.

4) Water Quality

As previously noted, monitoring data for Plan Area streams indicate that water quality is generally good. The Van Duzen, Eel, and Mattole rivers are "water quality limited" as defined in section 303(d) of the Clean Water Act. CDF has determined that in its opinion, five streams within the Plan Area have significant negative cumulative sediment impacts. These streams are Bear Creek, Jordan Creek, Stitz Creek, Elk River, and Freshwater Creek. The Van Duzen River flows through WAA 3. The Eel River and Bear, Jordan, and Stitz creeks are within WAA 4. The Mattole River flows through WAA 5. Elk River and Freshwater Creek are within WAA 1.

PALCO proposes to continue water quality monitoring as part of the implementation of the SYP/HCP. Implementation of the aquatic protection measures incorporated in this Plan, along with watershed-specific measures derived from watershed analyses, are expected to result in a trend of non-degradation or improvement in these systems. PALCO also anticipates that the U.S. Environmental Protection Agency will require preparation of a separate plan to address water quality issues in designated areas.

5) Air Quality

Regarding air quality, PALCO will continue to work closely with the North Coast Unified Air Quality Management District, CDF, and other landowners to mitigate the effects of slash burning. No significant adverse impacts to air quality from operations under the LTSY are expected.

6) Employment

As a measure of potential effects on the regional economy, PALCO estimated jobs per decade in relation to MBFN harvested per year. For purposes of the assessment, it was assumed that there would be six jobs per year for every million board feet harvested. Table 14 indicates the estimated number of jobs in relation to harvest units under the LTSY projections. Projected job loss over the period is less than 1.5% per year. Normal attrition at PALCO is about 15% per year. The projected decrease would not constitute a significant adverse impact on a regional scale, since other timberlands in the region are projected to begin increasing harvests during these periods. To further offset the effects, PALCO would make its best effort to maintain its employment at existing levels through purchase of open market logs and timberlands and continued investments in value-adding manufacturing.

Table 14
Estimated Jobs under LTSY Harvest Levels

Decade	Jobs
1	1,401
2	1,191
3	1,042
4	938
5	844
6	928
7	1,021
8	1,123
9	1,236
10	1,359
11	1,401
12	1,364

2. Alternatives Considered

As discussed in more detail in Part A of Volume VI, the federal ESA requires that HCPs identify alternatives to the proposed taking and explain why such alternatives were not selected. A broad range of impact avoidance, mitigation, and conservation strategies were proposed and considered in the course of preparing this Plan, including variations on the LTSY projections and HCP strategies.

Four primary alternatives are summarized here: No Take; Selective Harvest; Expanded (61,000-acre) Headwaters Reserve; and Higher Midterm Timber Production. Part G in Volume IV provides additional detail about these and other approaches.

a. No Take

Under this alternative, activities in the Plan Area would be conducted in a manner to avoid take of any federally listed, state listed, or state candidate species. Since no take would occur, PALCO would not need or obtain ITPs from USFWS, NMFS, or CDFG. PALCO would not be obligated to implement measures to minimize and mitigate the effects of take. Consequently, the Headwaters Reserve would not be established and none of the conservation plans in Volume IV would be implemented. This alternative was rejected because it would not provide the following environmental benefits associated with the Plan as proposed:

1. Protection of the Headwaters Reserve, including buffer areas around the old growth forest within the Reserve, in perpetuity;

2. Protection of the MMCAs and associated internal buffer areas;

3. Implementation of a comprehensive, inter-related habitat conservation strategies for terrestrial and aquatic species in the Plan Area; and

4. Implementation of various conservation measures for non-listed Covered Species.

This alternative also was rejected because of its potential negative effects, including:

- Fragmentation of second growth and residual stands adjacent to old growth areas with potential for resulting indirect impacts to old growth habitat areas through potential increased predation on marbled murrelets; and

- Continued economic uncertainty regarding the amount of harvest that might be expected from the PALCO property in the future and the resulting adverse economic impact to the economy of Humboldt County.

b. Selective Harvest

Under this alternative, the SYP elements of the Plan as proposed would be altered to eliminate clear-cutting and salvage logging in the Plan Area. Stands would be subject to selective harvest every 20 years, with a timber stand target of late seral forest conditions (CWHR 6). The maximum yearly harvest would be 2% of the timber inventory. In addition, a minimum of 20% of the property would have to be in late seral habitat. Two sub-alternatives for RMZs also were considered:

- FEMAT-standard buffers maintained for the term of the ITPs, and

- FEMAT-standard buffers as interim measures with final buffers being determined using a Washington Department of Natural Resources (DNR) style watershed analysis.

This alternative was not selected because a selective harvest strategy would require extensive road construction. It would limit PALCO's ability to use best silvicultural practices to manage its forests. The net improvement in aquatic protection over that in the proposed Plan is uncertain but is probably limited.

The alternative would also have a significant negative economic impact on PALCO. With respect to economic impacts, the FEMAT buffers alone would render unharvestable over 50% of PALCO's ownership. (Map 36 in Volume V illustrates the application of FEMAT buffers to the Plan Area.)

c. Expanded Headwaters Reserve

Under this alternative, a 61,000-acre reserve would be established instead the 7,500-acre reserve contemplated in the Headwaters Agreement. The approximate design of the reserve would be a large circle encompassing the six redwood groves (Allen Creek, Shaw Creek, Bell-Lawrence, Right 9, Owl Creek, Elkhead Springs) and the Headwaters tract and buffer. Outside of the reserve, the remainder of PALCO's property would be managed in the same manner as proposed in this Plan.

Approximately 30 percent of PALCO's holdings in the Plan Area would become part of the reserve, include stands with significant amounts of high quality old growth timber. PALCO is unwilling to commit such a large amount of land to habitat without compensation, and neither the federal ESA nor CESA requires such a commitment. The only method of creating the preserve, then, is through condemnation or voluntary sale. Neither the federal nor state governments has demonstrated that funds are available to acquire the reserve; and California voters have turned down ballot measures aimed at acquiring this property. The acquisition amount would far exceed any conservation acquisition undertaken by the federal and state governments since the enactment of the Land and Water Conservation Fund. In the absence of available funds for acquisition of the land, this alternative is not practicable.

d. Increased Midterm Production

This alternative was developed to determine the possible upper range of timber production on PALCO's lands. Under this alternative, higher harvest levels would be allowed during the midterm of the ITPs. Riparian buffers would be 125 feet for Class I streams and 75 feet for Class II streams, with extensive timber harvest allowed within these zones. Limits on harvesting would be set by existing FPRs. No MMCAs would be established, however, the Headwaters transactions would be completed. This alternative was rejected primarily because of the inherent conflicts between the timber production goals of the approach and ITP requirements to minimize as well as mitigate effects on listed species.

G. SYP/HCP Measures

The alternative selected by PALCO as the basis for this Plan is one that reconciles activities in the Plan Area with the requirements of the federal ESA and California FGC and substantially furthers timber production and conservation objectives in the process. Specifically, PALCO proposes to implement an extensive set of inter-related SYP and HCP measures. For purposes of this summary, the measures are grouped into nine components:

1. Headwaters Reserve
2. Measures to Conserve Habitat Diversity and Structural Components
3. Marbled Murrelet Conservation Plan
4. Northern Spotted Owl Conservation Plan
5. Aquatic Species Conservation Plan
6. Measures for Other List A Wildlife
7. Measures for List B Species
8. HCP Assurances and Implementation
9. SYP-related Measures

All measures presented here are from the reports in Volumes II, III, and IV. The included Map indicates the lands subject to the Headwaters transactions, the MMCAs, and stream and riparian resources conserved under the Plan.

1. Headwaters Reserve

Approximately 5,600 acres of PALCO's ownership will be transferred to government ownership and ultimately become part of a 7,500-acre Headwaters Reserve. The Headwaters Reserve contains the largest contiguous tract of privately owned old growth forest in the United States as well as second growth areas which will over time become old growth forest. Because of the size and biological values of the property, the conservation achieved by this transaction will have substantial beneficial effects on forest resources within the Plan Area as well as the region. Those beneficial effects, when combined with other environmental benefits of the Plan, will reduce the negative effects associated with removing old growth within the Plan Area and, in portions of the ownership near the Headwaters Reserve, will ensure the availability of habitat to certain species displaced from the ownership. The transaction also averts potentially significant adverse economic effects on Humboldt County and the region by allowing otherwise lawful timber operations to occur in the Plan Area at levels necessary to attain LTSY.

2. Measures to Conserve Habitat Diversity and Structural Components

a. Maintaining a Mix of Seral and Vegetation Types

To ensure that an appropriate mix of seral and vegetation types is maintained across the landscape over the Plan period, PALCO will apply and monitor the following conservation objectives and thresholds:

1. Throughout the planning period, PALCO's forested lands within each WAA will include at least 10% late seral, 5% mid-successional, 5% young forest, and 5% forest opening.

2. Old growth (a component of late seral) will not be subject to a specific retention requirement within WAAs or property-wide. However, harvesting of old growth not included within the MMCAs will be phased over the first two decades of Plan implementation (see Marbled Murrelet Conservation Plan in Volume IV).

3. Areas that have become dominated by hardwoods as a result of previous management but would otherwise support conifer-dominated forest may be converted back to conifers over the Plan period. However, hardwoods as a stand type will not be eliminated, and hardwood components within conifer seral types often will be retained.

Insert Map (same Map 1 in Volume V)

The PACIFIC LUMBER Company

HEADWATERS AGREEMENT

MAP 1

Mapscale 1 Inch = 2.7 Miles

MILES

FEET

- Headwaters Reserve Area (Federal/State Controlled)
- SPI Land Acquisition Area (PALCO Controlled)
- Other Ownerships
- Marbled Murrelet Conservation Areas (MCA)
- Marbled Murrelet Conservation Areas - Alternative
- 300 Ft. Marbled Murrelet Habitat Buffers
- Aquatic Protection Areas
- Existing State and County Parks
- Seasonal Restriction Areas

Data as of June 03, 1998

EUREKA

FORTUNA

REDWAY

DOBBYN CREEK

T5N T4N T3N T2N T1N T1S T2S

R2W R1W R1E R2E R3E R4E

PALCO

Map and Analysis by Paul Vincent - June 03, 1998

4. Prairie soil types will be kept in grasslands. Forest soil types that have been converted to grasslands will likely be replanted to conifers. The former consists primarily of lands currently used for grazing; the latter includes grass areas within stands classified as forest opening.

5. Riparian areas will be maintained in accordance with the measures identified herein, the WLPZ requirements of California FPRs, and other applicable federal and state laws.

b. Retaining and Recruiting Structural Components of Wildlife Habitat

To maintain important structural elements for wildlife habitat, such as snags, downed logs, live wildlife trees, and hardwoods, PALCO will implement the following measures.

1) Snags

Regarding snags, the objective will be to recruit and maintain snags, conifer or hardwood, in the following size categories:

1.2 per acre at least 30" DBH and at least 30' tall
2.4 per acre at least 20" DBH and at least 16' tall
1.2 per acre at least 15" DBH and at least 12' tall

The majority of snags and leave trees will be concentrated along Class I and II streams. Additional snags and green cull trees will be retained, preferably in clumps, within harvest units to meet the above objective and to distribute snags into upslope areas.

When applying the snag retention/recruitment objective within timber harvest units:

1. Larger snags may be substituted for smaller snags.

2. All snags will be retained which do not pose a safety hazard to workers during harvest operations.

3. Trees of appropriate sizes within the RMZs of Class I and II streams will be counted towards the objective.

4. If the objective cannot be met in a harvest unit (i.e., THP) with existing snags, green replacement trees may be substituted on a 1:1 ratio in the nearest size categories. Green cull trees and whitewood conifer species will be targeted for retention before redwood.

2) Downed Logs

Regarding downed logs, the objective will be to retain two downed logs per acre outside the Class I and II RMZs of any decay class with a size exceeding 15" diameter at the large end and 20' long. There will be no requirement to leave downed logs where they do not exist already.

3) Information Gathering and Monitoring

Due to the current lack of information regarding quantity and quality of snags and downed logs, monitoring is a key component of this strategy. Monitoring will develop data on these habitat components for each hydrologic unit of the PALCO ownership.

1. Information will be gathered by the RPF (or designee) concerning snags, downed wood, and leave trees and will be incorporated into the proposed THPs.

2. Monitoring of snags and downed logs will occur during reforestation inspections, timber stand improvement monitoring, or timber stand cruises. The monitoring program may be altered in the future, but if alterations are made, they will conform to the standards set forth here, and those developed in consultation with USFWS and CDFG.

4) Training Program

A training program for Registered Professional Foresters, wildlife and fisheries biologists, Licensed Timber Operators, and all other technicians responsible for implementing this strategy will be designed and implemented. PALCO will work with USFWS and CDFG in developing the training program.

5) Evaluation

At the end of the first year of Plan implementation, PALCO will meet with the USFWS and CDFG to review the data collection and monitoring procedures and determine if they are effective in producing the information required to implement the snag and downed log measures. Changes in procedures, if necessary, will be developed by PALCO in cooperation with USFWS and CDFG.

After five years of Plan implementation, the effectiveness of the recruitment measures will be evaluated based on monitoring results and an intensive inventory of stand components. If the snag objectives are not being met through the recruitment procedures identified above, PALCO will develop and implement measures which may include additional marking and retention of recruitment trees, girdling, or other forms of induced mortality.

Following the initial five-year assessment, the effectiveness of the measures and attainment of the objectives will be evaluated at intervals of five to ten years as necessary.

3. Marbled Murrelet Conservation Plan

Part B of Volume IV is the Marbled Murrelet Conservation Plan in its entirety, and the conservation and mitigation measures enumerated here are from that document.

The measures in the murrelet plan are based on information about the terrestrial habitat and old growth redwood on PALCO's land, terrestrial murrelet surveys, and murrelet surveys at-sea. Terrestrial habitat information is derived from PALCO's GIS forest type mapping. Terrestrial and marine marbled murrelet surveys were conducted and/or compiled by USDA Forest Service Redwood Sciences Laboratory, Arcata, California. Data from these sources were analyzed by Thomas Reid Associates (TRA), Palo Alto, California, under direction by the California Resources Agency. The TRA analyses were used by both PALCO and state and federal agencies in developing and assessing this component of the Plan. Part B of Volume IV includes reports on the analyses and accompanying figures and tables.

a. Establishment of the MMCAs

The primary impact minimization and mitigation measure for marbled murrelets is the conservation for the Plan period of actual or potential habitat in eight MMCAs. This strategy, when combined with the establishment of the Headwaters Reserve, will result in the conservation of the highest quality marbled murrelet habitat on PALCO lands.

The location of the eight MMCAs is shown in Map A. Table 15 summarizes the approximate acreage and various characteristics of each MMCA. Map 25 in Volume V shows the MMCAs and related old growth buffers; Map 26 shows the habitat details within the MMCAs.

b. Timber Management in the MMCAs

Timber management in the MMCAs shall be consistent with the goals and objectives of the MMCAs, and, except as expressly provided here, shall be conducted in consultation with the USFWS and CDFG.

1) Goals and Objectives

The goals and objectives of the MMCAs are as follows:

- Maintain the value of currently suitable marbled murrelet nesting habitat in the MMCAs.
- Recruit suitable marbled murrelet nesting habitat in residual stands in the MMCAs.
- Provide buffering for, and contiguity of suitable and recruitment nesting habitat in young growth stands within the MMCAs.

2) MMCA Silviculture

In consultation and with the concurrence, or at the request of USFWS and CDFG, at PALCO's option, the silvicultural prescriptions described below may be employed to advance the goals and objectives of the MMCAs. PALCO will not be required to undertake any such management in the MMCAs.

1. **Old growth** stand components within MMCAs are to be dedicated to retention and enhancement of murrelet nesting habitat values. Except as provided herein, no harvest or salvage activities shall be conducted.

2. **Residual** stand components are to be managed to recruit functional murrelet nesting habitat. Thinning may be permitted with prior consultation and concurrence by the wildlife agencies to enhance recruitment of second-growth trees into the residual overstory. Any permitted harvest shall occur outside of murrelet nesting season and without any new roads. No helicopter yarding shall be conducted.

3. **Second growth** stand components within and outside of residuals may be managed to buffer old growth and residual habitat and provide mature forest contiguity throughout MMCAs. Thinning or single tree selection may be permitted with prior consultation and concurrence by the wildlife agencies to accelerate recruitment of second growth trees into a mature condition which buffers residual and old growth canopy structure. Any permitted harvest shall occur outside of murrelet nesting season and without any new roads. No helicopter yarding shall be conducted.

c. MMCA Infrastructure and Land Use

Certain activities, roads and other facilities within the MMCAs on PALCO's lands will remain available for use, subject to the following conditions:

Table 15
Marbled Murrelet Conservation Areas

MMCA	Description
Lower North Fork Elk River	Approximately 450 acres. Has no unentered old growth; 36 acres of residuals at high density (15-30 trees per acre), and 200 acres of low-density residuals (less than 15 trees per acre).
Bell Lawrence & Booth's Run	Approximately 1,418 acres. Has large core area and two smaller stands of old growth Douglas-fir, plus several stands of residual

	redwood forest. Buffered by the Booth's Run stand, which is immediately adjacent to the south.
Elk Head Residual	Approximately 65 acres of low density residual redwood,and 285 acres of young forest. Located immediately east and adjacent to proposed Headwaters Reserve.
Road 7 and 9 – Shaw Complex	Combined, approximately 1,313 acres. Has 31 acres of old growth Douglas-fir, 353 acres of old growth redwood, and 406 acres of residual redwood. Road 7 is a small area of old growth redwood, plus a larger area of residuals. Road 9 is a core area of residuals. Rt. Side Road 9 is a core area of old growth redwood, plus a surrounding area of residuals. Shaw Gift is a large area of old growth redwood, plus some residuals, and old growth Douglas-fir.
Cooper Mill	Approximately 704 acres. Has 151 acres of high density residual redwood and 245 acres of low density residuals. Located immediately adjacent to proposed Headwaters Reserve to the north.
Allen Creek and Road 3	Approximately 2,293 acres. Has approximately 393 acres of old growth redwood, 40 acres of high density residuals, and 930 acres of low density residuals. Core area of the Allen Creek stand is unfragmented, with a large area of old growth redwood. Residual and mid-seral are adjacent to and buffer the core. Eastern section adjacent to the Road 3 Area is more fragmented, with residuals buffered by young forest. The Road 3 stand is a large block of unfragmented residual forest, buffered by young forest. It is located immediately adjacent to the fragmented portions of Allen Creek to the west. PALCO's Rock Quarry 1/Road 24 is located in this MMCA.
Grizzley Creek	Approximately 1,059 acres. Has 118 acres of old growth redwood, and 530 acres of residual redwood forest. Consists of several discrete stands (some fragmented but well-buffered) surrounding Grizzley Creek State Park, which also has old growth redwood. Under the Plan, PALCO has option to harvest Grizzley Creek or Owl Creek.
Owl Creek	Approximately 925 acres of forest, with 317 acres of old growth redwood, 240 acres of residual redwood, and 19 acres of old growth or residual Douglas-fir forest. Old growth is fragmented, with large amounts of edge, but well-buffered from the adjacent residual redwood forest. Under the Plan, PALCO has option to harvest Grizzley Creek or Owl Creek.

1. Existing, active, previously used haul roads, borrow pit sources and permitted rock quarries within MMCAs may be used, maintained, storm-proofed or abandoned. Active roads within the MMCAs are mapped in the Murrelet Conservation Plan in Volume IV.

2. Properly licensed and permitted game hunting -- including firearm discharge -- may continue, during the appropriate seasons, from and after September 16 of each year until March 23, to avoid potential disturbance to nesting murrelets.

3. Maintenance and use of existing roads and facilities can require the removal of trees. To the extent feasible, such activities with the potential for disturbance shall be conducted outside the marbled murrelet breeding season.

4. Fuel removal in residual and second growth buffers only will require consultation and written permission from USFWS and CDFG, except as otherwise provided in a certified fire management plan.

5. Fire suppression will be allowed as otherwise provided in a fire management plan for the MMCAs approved by USFWS, NMFS, and CDFG within one year of the effective date of this Plan.

6. Harvesting or salvage necessary for road maintenance, fire suppression, road storm-proofing or abandonment shall be kept to a minimum. Downed, wind thrown and hazard trees within the streamside protection zone must be retained as required by the terms of the Aquatics Species Conservation Plan (Volume IV Part D).

7. Stream enhancement projects in the MMCAs may be undertaken with prior written concurrence of USFWS and CDFG.

8. Borrow pits and rock material sources within the MMCAs may be opened, and the material used for roads, drainage, maintenance, and repair without consultation or concurrence with USFWS and CDFG so long as no trees greater than 12" DBH are removed from said locations, and no single new borrow pit area greater than 2 acres is cleared, with a maximum limit of no more than 2 sites in any MMCA, with a cumulative total area of 4 acres cleared after the effective date of this permit, for the full life of the permit, in any one MMCA. Any borrow pit site tree removal or land clearance exceeding these limits from and after the effective date of this permit will require consultation with USFWS and CDFG.

9. Scientific surveys and studies as part of the monitoring program described ***infra*** may be undertaken.

10. Within the Allen Creek MMCA, as configured in consultation with USFWS and CDFG, is located one of PALCO's permitted hard rock quarries (Quarry 1/Road 24). The specific location, environmental setting, permit provisions, mitigations, certified environmental documentation and approved reclamation plan for this permitted and active quarry are included in the Plan at Volume II, Part J. Briefly, Quarry 1/Road 24 is located in the Yager Creek drainage, approximately 5 miles upstream from Carlotta, California. While quarrying operations typically involve excavation, drilling, blasting, screening, loading and related activities throughout the year, to mitigate and minimize of the potential for disturbance effects upon murrelets in the Allen Creek MMCA, PALCO will limit all blasting to the period after September 15 and prior to March 24 of each year. To the maximum extent feasible, PALCO will also implement measures to mitigate disturbance impacts at other times of the year. These measures will include the recommendations by CDFG, for this quarry operation during the environmental review and permitting process. These measures are:

    a) The loading of smaller aggregate into empty trucks prior to large rock, to lessen the impact of large rock; and

b) The noise generated by the back gate striking the body of the dump truck should be mitigated by one of several methods: (1) pulling away from the dump site slowly; (2) padding the area between the gate and the body; or (3) removing the back gate from the body of the truck.

d. Harvest of Remaining Timberlands Outside of MMCAs

As proposed in this Plan, the MMCA configuration has been devised to conserve the majority of murrelet habitat on PALCO's timberlands throughout the life of the plan. The MMCAs include most of the current, high-quality murrelet nesting habitat and the largest contiguous old growth redwood stands outside of the Headwaters Reserve. The MMCAs have been configured to provide contiguity and connectivity to the maximum extent practicable, as well as buffering to protect high quality habitat. In all, the MMCAs involve the conservation of approximately 8,500 acres of redwood timber in addition to the approximately 7,500-acre Headwaters Reserve.

Pursuant to this Plan, timber harvest and management will occur in those areas not conserved in MMCAs, subject to the other restrictions specifically described in the Plan (e.g., riparian area restrictions identified in the Aquatic Species Conseration Plan). Such harvest will include the removal of habitat either currently occupied or potentially available for murrelet use. Based on consultation with USFWS and CDFG and consideration of what constitutes "practical" measures (see Part B in Volume IV), PALCO has devised a feasible program for minimization of "take" anticipated or foreseeable from harvest in those areas outside the MMCA reserves slated for harvest under this Plan. This program incorporates the best available scientific and commercial information to reduce direct take of nesting murrelets, chicks, and pre-fledged young to the maximum extent practicable, as follows:

1) Vegetative Buffers for Suitable Marbled Murrelet Nesting Habitat in Public Preserves

Vegetative buffers along suitable habitat edges will be implemented with the intent of minimizing the impacts of potential predators and microclimate effects.

a) Location and Width of Buffers

Along the northern Humboldt Redwoods State Park (HRSP)/PALCO boundary, from Highway 101 to approximately Snow Prairie, (See Volume V, Maps 25, 26) and for other adjacent HRSP lands, a 300' vegetative buffer from suitable marbled murrelet nesting habitat will be maintained. In the 300' buffer the late seral silvicultural prescription (Regime Codes 121-125, Selection every 20 years, retention of 240 square foot Residual Basal Area) shall be utilized as a minimum for stand retention after harvest.

For the Grizzly Creek State Park public lands along Highway 36, a 300' vegetative buffer from suitable marbled murrelet nesting habitat will be maintained. In the 300' buffer only the late seral silvicultural prescription (Regime Codes 121-125, Selection every 20 years, retention of 240 square feet Residual Basal Area) shall be utilized as a minimum for stand retention after harvest.

Suitable nesting habitat within the MMCAs has been buffered within the MMCA boundaries. No additional buffering is necessary.

b) Seasonal Restrictions in Buffer Zones

Seasonal restrictions adjacent to suitable nesting habitat shall be implemented for specific operations with the intent of avoiding and minimizing "take" on public preserves (Grizzley Creek State Park, HRSP, Headwaters Reserve).

1. A seasonal restriction on timber operations (such as falling, bucking, yarding, and log loading) will be implemented within 0.25 mile, adjacent to suitable nesting habitat on public preserves, including

portions of the Headwaters Reserve (see Volume 5, Map 26). The seasonal restriction shall be implemented during the marbled murrelet breeding season (currently applied within California by the USFWS and CDFG as being from March 24 to September 15).

2. The seasonal restriction does not preclude use, maintenance and storm-proofing of existing, previously used haul roads and other facilities.

3. Exceptions to the seasonal restriction limitations may be approved through consultation with USFWS and CDFG.

4. Seasonal restrictions are not applied to protect breeding murrelets within the MMCAs for Covered Activities outside of the MMCAs because the MMCAs have been designed to incorporate appropriate internal buffers. "Take" is minimized through the implementation of the 300' internal vegetative buffers (see d.1)a) above), and due to the infrequent management entries adjacent to the MMCAs. To the greatest extent feasible, activities with potential for disturbance of nesting marbled murrelets within the MMCAs shall be conducted outside of the marbled murrelet breeding season.

2) Limitations in Areas of Known Active Nests

In those areas outside MMCAs on PALCO lands, harvest will occur, including operations conducted during the nesting season. However, whenever an active nest is discovered, activities will be restricted within 0.25 mile of the site until such time as the nestling fledges, or the nest is determined to be abandoned.

3) Limited Seasonal Restrictions on Timber Falling in Selected Habitat Stands

PALCO has considered and agreed to limited seasonal restrictions on timber falling in either the Owl Creek or Grizzley Creek MMCAs, whichever is chosen to be harvested. These additional restrictions, in conjunction with the other measures outlined herein, constitute the maximum practicable operational limitations. In PALCO's Owl Creek or Grizzley Creek MMCAs, whichever is chosen for harvest, PALCO will refrain from conducting timber falling from May 1 to August 10. This is the period of time each year including the greatest level of murrelet nesting activity as correlated with the highest detected levels of murrelet occupancy behavior.

e. Monitoring

PALCO will monitor implementation of the murrelet measures on its lands, and with the cooperation and permission of the other managing federal and state agencies, on lands transferred under the proposed Headwaters acquisition, and on other adjacent lands and waters. The goals of monitoring will be to determine whether the murrelet conservation strategies are being implemented as written and having the predicted impact and effect on marbled murrelets. These two monitoring goals can be regarded as implementation (or compliance) monitoring, and effectiveness monitoring, respectively.

1) Implementation Monitoring

Implementation monitoring will document the types, amounts, and locations of forest management activities carried out within the HCP planning area. These monitoring activities may take the form of periodic reports on landscape-level conditions, using inventory and remote sensing information. In addition to the annual reporting requirements indicated in the IA (section 3.1.1), the Plan provides for a report every 5 years to USFWS and CDFG, documenting (through aerial photography, GIS mapping, GPS reference points where available, and other methods available and appropriate) status, changes and trends in the MMCA areas. Items to be addressed in the report will include, but not be limited to, the following:

1. Depiction of the MMCA boundaries and indications of the location and scope of nearby harvest operations.

2. General description of any silvicultural activities undertaken with the advice and consent of USFWS and CDFG within the MMCAs, and a record of the consultation, correspondence, planning or other documentation associated with such activity.

3. Depiction, description or other documentation, to the extent available, of any other consultation or correspondence between PALCO and USFWS/CDFG regarding any of the following:

   a) use, expansion, abandonment or reclamation of the permitted Rock Quarry No. 1/Road 24 located within the Allen Creek MMCA;

   b) use, expansion or tree removal to facilitate borrow pit material sources within the MMCAs, as provided in this Plan;

   c) road use, maintenance, storm-proofing, drainage repair or maintenance, or related tree removal for same as provided in this Plan.

   d) tree removal due to safety hazards.

2) Effectiveness Monitoring

Effectiveness monitoring will seek to document changes in the marbled murrelet populations on PALCO lands, and, to a lesser degree, on neighboring lands and waters, and changes in the habitat of these populations on Company lands, as more particularly described below.

Effectiveness monitoring will be carried out by PALCO personnel and/or by outside contractors. The program will be overseen by the existing Scientific Review Panel, who will meet annually for the first five years of the Plan to review monitoring program design, results, and to make recommendations for future studies. All data and results will also be reported to USFWS and CDFG.

Prior to the design and implementation of any monitoring plan, PALCO will seek advice from statistical consultants on the most appropriate design of monitoring. This advice will include explicit treatment of statistical power, and the necessary effort to determine whether effects have occurred. These preliminary studies will then be used to guide the monitoring program, in consultation with the Scientific Review Panel, USFWS and CDFG.

Effectiveness monitoring will be limited to terrestrial monitoring on PALCO lands, although, in keeping with the conservation objectives of this Plan, PALCO may also undertake to survey neighboring lands (subject to appropriate access and permission) and waters. Specific objectives that will guide the effectiveness monitoring process include:

1. Maintain marbled murrelet nesting habitat in the occupied stands within the MMCAs;

2. Maintain or recruit murrelet nesting habitat in residual stands within MMCAs;

3. Recruit closed canopy high basal area second growth buffers for residual and old growth stands in the MMCAs;

4. Recruit second growth that provides shelter for nest platforms in residual stands in MMCAs; and

5. Minimize new development or activity which could disturb murrelet nesting in MMCAs.

3) Research and Management Questions

Monitoring associated with the conservation objectives in this Plan is intended to respond to the following research and management questions:

1. Are marbled murrelets continuing to use MMCA stands?

2. Are marbled murrelets nesting successfully in the MMCA stands?

3. What are the trends in local marbled murrelet populations?

4. What is the distribution of habitat in the bioregion?

4) Monitoring Reports and Meetings

Annually, PALCO will provide to USFWS and CDFG a monitoring report detailing the following:

- The monitoring survey locations, results, data and analyses undertaken during the past year pursuant to this Plan;

- Depictions, descriptions or discussions of any purpose, planning or design documentation related to effectiveness monitoring anticipated for the coming year.

If requested and no sooner than 30 days after the provision of the report, PALCO will meet with USFWS and CDFG to discuss the report and means, methods, techniques or adjustments in survey effort, data analyses or results interpretations. This consultation shall be advisory only with the goal of refining survey or analytical efforts to achieve the objectives and answer the research and management questions described above.

Following the meeting with USFWS and CDFG, for at least the first 5 years of Plan implementation, PALCO will convene a meeting of the Scientific Advisory Panel to obtain the Panel's input and advice regarding effectiveness monitoring techniques, data management, analysis and interpretation, protocols or other related material and information. PALCO will provide USFWS and CDFG at least 30 days advance notice of the date, time, and place it will be convening the Panel, provide USFWS and CDFG access and opportunity to participate, and prepare a summary and minutes of the proceedings.

4. Northern Spotted Owl Conservation Plan

Volume IV includes the Northern Spotted Owl Conservation Plan in its entirety. In general, impacts to northern spotted owls will be minimized and mitigated by providing nesting, roosting and foraging habitat for the species throughout the Plan period, by protecting all known active nest sites for the first five years of the Plan, and by reducing the likelihood that nesting owls will be disturbed during timber harvest and other activities.

a. Habitat Retention

Throughout the plan period, at least 10% of the forested landscape within WAAs will be suitable nesting habitat for NSOs. The amount of habitat will be determined using the crosswalk between timber types and the CWHR Version 5.2 matrix for spotted owl habitat. (Although there have been more recent versions of CWHR produced, for example version 6.0, there have been no changes in the habitat matrix which would effect the application of the crosswalk).

Also, in the bio-region on PALCO lands, approximately 8,500 acres of old growth, residual, and buffered habitat in the MMCAs will be conserved throughout the Plan period. As an integral part of this Plan, the 7500-acre Headwaters Reserve will be permanently protected under federal and state ownership.

b. Surveys

1. For active operations between February 15 and March 15, the THP area and a 1,000' buffer will be surveyed, with one visit between February 15 and March 1 or later if necessary, and two visits between March 1 and March 15, or later if necessary. Surveys will be conducted between sunset and sunrise when timber operations are not occurring. This is also the period when the owls are most active.

2. For new operations initiated between March 15 and August 31, the THP area and a 1,000' buffer will be surveyed. Two survey visits will occur prior to the start of operations but after March 1. Surveys will be conducted between sunset and sunrise when timber operations are not occurring. This is also the period when the owls are most active.

3. Nesting status of owls will be determined within 48 hours for all contacts made during surveys whenever feasible. Operations will continue while status is being determined. Operations will cease in the area of the THP where the status visit is occurring to avoid destruction of an unknown nest site, and also for the safety of the crews. If felling or yarding crews locate spotted owls, operations will cease until nesting status can be determined.

4. Surveys will not be required for activities other than timber harvest or for salvage logging done under a salvage exemption to the FPRs.

c. Protection of Activity Centers

An activity center is the area including the primary roost tree of a non-nesting pair or single, or the nest tree of a nesting pair. Measures to protect these sites will be as follows:

1. In areas where the NSO status has been determined to be nesting; or until a wildlife biologist determines that nesting has failed, or that young are capable of avoiding direct impact of timber harvest:
   a) No harvesting will occur during the breeding season (March 1 to August 31) within a 1,000' radius of the nest tree.
   b) If status is determined to be a non-nesting pair or single owl, 18 acres around the activity center (the area equivalent to a 500' radius circle) will be protected. The protected 18 acres will conform to natural landscape features as laid out by PALCO's wildlife biologist, and the protected activity center must be at least 400' wide.
2. During the first five years of Plan implementation:
   a) One activity center per pair will be maintained (except for those unoccupied sites which are taken);
   b) All 1997 activity centers will be maintained (except for those unoccupied sites which are taken), unless a new activity center is located within 0.5 mile.
   c) All new pair activity centers will be maintained unless (in a subsequent season) a new activity center is located within 0.5 mile.
   d) During the breeding season, the 1,000' radius zones will be maintained around all pairs unless a non-nesting or single status is confirmed.
   e) Outside the breeding season, 18 acres (the area equivalent to a 500' radius circle) around each pair activity center will be protected. The protected 18 acres will conform to natural landscape features as laid out by PALCO's wildlife biologist, and the protected activity center must be at least 400' wide.

3. Road construction, blasting, and other loud equipment noises (such as chainsaws, excavators, and loaders) will not occur in activity center protection zones during the breeding season.

4. Exceptions to the above restrictions may be approved following consultation with USFWS and/or CDFG.

d. Monitoring

1. The amount of spotted owl habitat in the Plan Area will be updated annually, and recalculated following vegetation inventories.
2. Each survey season, PALCO shall employ a method of estimating the baseline spotted owl population in the Plan Area. For this estimate, PALCO proposes to modify the sampling scheme as described in Azuma et al. (1990) "Estimating the Occupancy of Spotted Owl Habitat Areas by Sampling and Adjusting for Bias". Those owls contacted during sampling surveys will be visited to determine nesting status. For those owls determined to have a nesting status, reproductive status (number of young produced) will be determined. The nesting and reproductive status information will be reported and compared to regional results in the annual report (#5 below).
3. The average of the results of the first five survey years will be used to establish a total baseline population estimate.
4. Following the first five years and the establishment of the baseline population estimate, PALCO will survey a sample area each year and compare results to the baseline.
    a) If the population is estimated to be greater than 75% of the baseline, the measures described above will be continued.
    b) If the population estimates fall below 75% of the baseline for three consecutive years, PALCO will convene with USFWS and evaluate reasons for the decline and means for managing the spotted owl population.
    c) If the population estimate falls below 67% of the baseline estimate for three consecutive years, PALCO will meet with USFWS to develop a "no take" management strategy and that strategy will be used until the population estimate is above 67% for three consecutive years.
5. Annual reports will be provided to USFWS regarding implementation of the spotted owl measures.

5. Aquatic Species Conservation Plan

Part D in Volume IV presents the Aquatic Species Conservation Plan in its entirety. The plan is a habitat-based impact avoidance, mitigation, and conservation strategy for List A and B fish species. In general, the measures are expected to increase the abundance of deep water habitats and instream cover, maintain or reduce water temperature, and improve conditions in gravels used for spawning, and as prey production areas. These expected changes will be beneficial for trout and salmon. In addition, growth rates, the number of fish supported by individual stream reaches (i.e., carrying capacity), and overall survival rates are expected to increase over current conditions. Instream restoration and hatchery supplementation should also improve trout and salmon production. However, the benefit of these measures is secondary to the permanent benefits of the road and timber harvest related measures. The measures also will benefit certain List A wildlife, particularly the List A amphibians and reptile (see Table 2). These benefits are discussed in the description of measures for other List A wildlife.

Measures are grouped into six categories: watershed analysis, control of sediment from road and other sources, stream and riparian habitat conservation, measures for timber operations, measures for other activities, and measures as applied to List A fish species.

a. Watershed Analysis

As provided under the Pre-permit Application Agreement, PALCO will endeavor to complete watershed analyses on all of its ownership within three years of obtaining ITPs. The general approach and the extent to which the interim strategy described here can be modified by watershed analysis is discussed in detail in Volume IV Part D. The watershed analyses will be performed on all PALCO lands using a modified version of the Washington Forest Practices Board Manual: Standard Methodology for Conducting Watershed Analysis – Version 4.0 November 1997 ("Washington Department of Natural Resources Methodology").

This methodology is the most widely used watershed analysis method in the Pacific Northwest and is widely recognized as a replicable and scientifically based method. The Washington Department of Natural Resources Methodology has been used in a modified version by USFWS and NMFS in other multi-species habitat conservation plans (e.g., Plum Creek HCP). PALCO will collaborate with state and federal agencies to adapt the methodologies to California conditions. A PALCO-Agency team is currently being organized for that purpose.

PALCO expects that watershed analysis will result in site-specific management prescriptions. Consequently, it can be used to modify some or all of the interim prescriptions described here. The general approach and the extent to which the interim strategy described here can be modified by watershed analysis is discussed in detail in Volume IV Part D. A pilot watershed analysis will be conducted in Freshwater Creek in the summer of 1998. It is anticipated that a watershed analysis of the Elk River basin will follow in 1999. Qualified scientists and technical staff will conduct all assessment work, and the process will be open for public comment. Public presentations will be scheduled to explain the process and present the results.

b. Control of Sediment from Roads and Other Sources

1) Sediment Assessment

PALCO will assess the existing road network and associated sediment sources on its lands either as part of the watershed analysis or the road storm-proofing program protocols (see below). Given the accelerated schedule being proposed for watershed analysis, most of this assessment is likely to occur within the first few years after issuance of the ITPs. However, at a minimum, the assessments must be completed as follows:

- Elk River, Freshwater Creek, Lawrence Creek, and Yager Creek will be evaluated within the first decade of Plan implementation;
- Van Duzen and Middle Eel rivers will be evaluated during or before the second decade; and
- Larabee Creek, Salmon Creek, and Mattole and Bear rivers will be evaluated during or before the third decade.

All sites assigned a high or medium priority rating based on the audit of potential sediment sources will be storm-proofed over the first 30 years of Plan implementation.

2) Road Storm-proofing

Until all active roads have been storm-proofed, at least 500 miles of existing roads per decade will be improved to meet the storm-proofing standards identified in the PWA guidelines (Part N in Volume II). PALCO will work closely with the agencies to identify priority areas for this work. Storm-proofing conducted as part of THPs will count towards the per-decade objective. When used in this Plan, the term storm-proofing describes a process which involves the following elements:

1. An audit of potential sediment sources along a road is conducted. A trained observer walks the road segment looking for actual or potential occurrences of erosion, slippage, mass wasting, blocked or

perched culverts, or other potential sediment sources. The audits document instances of Humboldt crossings, unstable fill slopes for roads and landings, stream crossings that have high potential for culvert blockage and diversion of stream flows onto the road bed, sufficient drainage and diversion of road drainage directly into watercourses.

2. The likelihood that each identified feature will deliver sediment to watercourses is also evaluated as part of the road audit, as is the total volume of sediment that could be prevented from delivery if remedial action is taken.

3. Based on the volume of sediment saved and likelihood of delivery, sediment sites are assigned a rating of high, medium or low priority.

4. All high and medium priority sites are then scheduled for corrective action. Corrective action typically requires an excavator, bulldozer, and one or more dump trucks to dig up and replace stream crossings, install drainage structures, remove unstable fill, alter the road bed to reduce the potential for diversion of flows onto the road surface, and the installation of rolling dips and/or water bars to route water and sediment.

5. Storm-proofing is considered complete when the specified corrective actions are complete, and the roads database and GIS system are updated to show that the subject road has been storm-proofed.

3) Road Construction, Maintenance, Improvements and Abandonment

1. For purposes of this Plan, a road will be considered upgraded when it is well drained and shows no signs of imminent failure (e.g., as evidenced by slumping scarps or cracks in the road fill) which would deliver sediment to a watercourse. Actions necessary to upgrade a road include the installation of ditch relief culverts and/or rolling dips where significant downcutting of the ditch is noted and removal or stabilization of unstable fill material at sites showing signs of imminent failure which could impact a watercourse. An upgraded road, as described above meets the definition used in the Plan of "complying with the specifications described in the Handbook for Forest and Ranch Roads (Weaver and Hagans, 1994.)"

2. All new roads will be built to site-specific storm-proof specifications. (See previous storm-proofing discussion.)

3. New roads will not be constructed in RMZs except for crossings or when feasible alternatives that would have less environmental impact are clearly not available as determined through consultation with the appropriate agencies, and will be designed to minimize the number of stream crossings and avoid mass wasting risk areas. Road layout will attempt to follow natural grades to help limit sedimentation, will be constructed on slopes primarily under 50%, and will be single lane (between 12 to 14 feet wide). In addition, bridges, culverts, or fords at stream crossings will provide for adequate passage of water during storm events.

4. For all new roads, structures over fish-bearing and restorable fish-bearing streams will be designed to provide for unimpeded fish passage. This could involve use of bottomless or baffled culverts, bridges, or other such structures. Where culverts are used they will be installed at an appropriate gradient, be sized to permit passage of a 100-year recurrence interval flood, and will contain downstream storm-proofing of the stream bed to ensure that they are passable, and to prevent culvert "perching." Fish passage will be ensured by adhering to guidelines for culvert installation by NMFS, or by agency review of alternate installation measures.

5. Road or landing construction or reconstruction shall comply with applicable state and federal laws and shall not occur during periods of measurable precipitation (excluding fog drizzle or drip) and shall not resume thereafter until and unless soil moisture conditions are not in excess of that which occurs from normal road watering or light rainfall such that the construction or reconstruction activities will result in the loss of soil materials in amounts that will cause a visible increase in the turbidity in a

Class I, II, or III watercourse, or in any drainage facility or road surface that drains directly to a Class I, II, or III watercourse (not applicable to standing water that is not draining directly to a watercourse). During each winter period (which for these purposes shall be between November first of each year and April first of the following year) no more than 2.5 miles of new road construction and 5 miles of reconstruction or storm-proofing shall occur on the Plan Area unless such additional work is approved after consultation with NMFS, USFWS, and CDFG. PALCO and the agencies shall reevaluate these winter mileage limitations during the first three years of plan implementation to determine their effectiveness. If modifications are deemed appropriate, PALCO and the agencies shall meet and agree on any necessary changes.

4) Road Inspections

1. All open (i.e., non-abandoned) roads will be inspected at least yearly.

2. Roads will be inspected during the winter period incidental to normal operations, and all occurrences of road slippage, erosion, or impending mass failure, blocked culverts, and failures of erosion control measures will be noted.

3. Any maintenance needs identified by inspections will be performed by the end of the field season following the inspection.

5) Wet Weather Road Use Restrictions

Truck hauling, road grading, road rocking, or other non-emergency road use activities shall comply with applicable federal and state laws and shall cease when the activities result in a visible increase in the turbidity in a Class I, II, or III watercourse, or in any drainage facility or road surface that drains directly to a Class I, II, or III watercourse (not applicable to standing water that is not draining directly to a watercourse). Once these activities have ceased due to the foregoing conditions, these activities shall not resume until and unless soil moisture conditions are not in excess of that which occurs from normal road watering or light rainfall such that use will result in the loss of surface materials from the road in amounts that will cause a visible increase in the turbidity in a Class I, II, or III watercourse, or in any drainage facility or road surface that drains directly to a Class I, II, or III watercourse (not applicable to standing water that is not draining directly to a watercourse).

6) Hillslope Management

The hillslope management-mass wasting process will apply to all portions of PALCO's ownership, including RMZs. The prescriptions in the RMZs for mass wasting will not be less restrictive than the riparian prescriptions developed as part of the interim or default strategies or through watershed analysis as appropriate and applicable to this Plan. Specific language regarding the timing of the geologic review and determination is being negotiated with the agencies. In the interim, PALCO will use the following standards.

1. PALCO will not harvest or construct new roads in portions of its ownership with an "extreme" mass wasting potential, in inner gorges, headwall swales, or unstable areas without a geologist's report recommending alternative prescriptions that are approved by CDF.

2. In areas where the potential for mass wasting is rated as "very high", or "high," PALCO will not operate heavy equipment off of existing roads or construct new roads, without a geologist's report recommending alternative prescriptions that are approved by CDF. The geologist's written report must accompany the THP when submitted for review.

3. NMFS, CDFG and EPA or Regional Water Quality Control Board shall be notified of all THPs that are being submitted on areas of extreme, very high and high mass wasting potential in addition to inner gorges, headwall swales, and unstable areas, if the proposed operation goes beyond the default

prescriptions. A registered geologist shall assess the influence of the proposed operation on the risk of hillslope failure and prepare a written report. If required (i.e., if prescriptions other than the defaults are being proposed), the geologist's report along with the THP will be sent to NMFS, CDFG, and either EPA, or the Regional Water Control Quality Board upon THP submission. If the notified agencies have concerns regarding the harvest proposal related to the risk of mass wasting, they may communicate such concerns to the RPF and CDF within 30 days of receipt of materials from PALCO or until the close of the public comment period, whichever is longer. As mandated under the FPA, CDF, as lead agency for THP review, will determine whether the mass wasting mitigation measures contained in the THP will avoid significant impacts.

7) Measures to Minimize Surface Erosion in Riparian Areas

Within WLPZs, PALCO will treat all sites of exposed mineral soils, resulting from forestry activities, within watercourse protection zones that are equal to or greater than 100 sq ft, or areas less than 100 sq ft which are on slopes greater than 30 percent if the site can deliver fine sediment to watercourses. Exposed mineral soil treatments can include revegetation or other erosion control measures including, but not limited to, seeding and mulching. Watercourse crossings will also be treated to avoid or minimize sediment delivery, using watershed analysis and/or road storm-proofing protocols to determine the appropriate treatments to be used on all such crossings. Cable corridors (cable roads) that divert or carry water away from natural drainage patterns or channelize run-off that reaches watercourses will have waterbreaks installed at intervals as per the FPRs (14 CCR 914.6).

c. Stream and Riparian Habitat Conservation

These measures are part of the Aquatic Species Conservation Plan, which is included in Volume IV Part D. All measures described here represent interim prescriptions that will be replaced by prescriptions developed through the watershed analysis process. If the watershed analysis process is not completed for a particular watershed within three years after issuance of the ITPs, certain default prescriptions will automatically be imposed on that watershed until watershed analysis is completed. A detailed description of the relationship between interim prescriptions, default prescriptions, and watershed analysis is presented in Volume IV Part D.

1) Habitat Condition Goals

NMFS and cooperating agencies (e.g., USEPA, USFWS, state agencies) have developed a matrix that identifies criteria to assess "properly functioning habitat" conditions in streams along the north coast of California (summarized in Table 16). The matrix was developed by an interagency team based on a review of literature on desirable conditions for anadromous salmonids, particularly coho salmon, and on professional judgment.

It is PALCO's view that, although the matrix does a commendable job of trying to identify what constitutes "good" conditions for trout and salmon, there are technical concerns about the applicability to, and achievability of the matrix values to streams on PALCO's ownership. For example, most of the reviewed references were not based on studies conducted in redwood forests, and contemporary data from unmanaged reference streams and historic studies of old growth redwood forests show that some of the goals are not achieved on the north coast even in the absence of logging and road building.

The matrix therefore is a "starting point" for assessing the properly functioning conditions but that additional research and monitoring, and modification of the matrix to site-specific conditions on the ownership will lead to changes in the matrix values. In addition, the matrix contains some habitat goals, such as tree retention standards along stream corridors, that have been superseded by the scientific research and negotiation conducted during work on PALCO's aquatic conservation strategy subsequent to publication of the matrix.

Despite the concerns and limits noted above, PALCO and the agencies agree that the aquatic conservation strategy for the Plan Area should consider the properly functioning conditions in the matrix. In addition, all parties agree that, if successful, the aquatic conservation strategy should lead to stream conditions that trend toward the key goals in the matrix. Thus, by agreement with the agencies: 1) the matrix is used here to identify a desirable future state that the aquatic strategy will strive to achieve, and 2) the matrix does not constitute enforcement standards that must be achieved during the life of the Plan.

Table 16
NMFS Aquatic "Properly Functioning Conditions" Matrix: Key Goals

Biological Impact/Concern	Parameter	Target
Water Quality	***Temperature***	11.8-14.6 ^{o}C
	Sediment	
	1) % fine < 0.85 mm	1) Class I & II streams: < 11-16%
	2) pebble counts	2) D_{50} of 65-95 mm
	3) turbidity	3) no visible increase due to timber operations in Class I, II, or III streams
	4) % particles < 6.5 mm	4) < 20-25% in Class I & II Streams
Habitat Elements	***Large Woody Debris***	Channel Width (ft) / Mean Volume (cubic ft) 15 / 13 20 / 26 25 / 38 30 / 51 35 / 63 40 / 75 45 / 88 50 / 100 55 / 113 60 / 125 65 / 127
	Pool Frequency	
	1) Streams with gradient >3% and ave. width <10m	
	a) pool to pool spacing based on bfs widths	a) 1 pool per every 6 bankfull channel widths
	b) percent of stream surface area comprised of pool habitat	b) pool area >20% of the total stream surface area
	c) percent of number of pools associated with LWD	c) >90% of # of pools associated with LWD
	2) Streams with gradient <3% and ave. width < 19 m.	
	a) pool to pool spacing based on bfs widths	a) 1 pool per every 6 bfs channel widths
	b) percent of stream surface area comprised of pool habitat	b) pool area >25% of the total stream surface area
	c) percent of number of pools associated with LWD	c) >50% of # of pools associated with LWD
	Pool Quality	
	a) maximum depth	a) >3 ft maximum depth
	b) volume	b) V* = <20%
Riparian Buffers	***Water Temperatures***	
	1) Where high, mid-to-late summer water temp. regimes exist	
	a) overstory tree canopy closure	a) ave. of at least 85% overstory tree canopy closure
	Tree Abundance	
	1) Redwood dominated forest	1) 23.8 > 32 inches, 17.4 > 40 inches
	2) Douglas-fir dominated forest	2) 16.3 > 30 inches, 9 > 40 inches

bfs = bankfull stream

The properly functioning conditions matrix identifies several biologically important, quantitative ("key") variables that can be used to assess the efficacy of the aquatic conservation strategy:

- Fine sediments <0.85 mm

- Median particle size (i.e. D_{50})
- Water temperature
- Canopy cover
- Pool abundance/size
- Large woody debris volume
- Tree abundance

PALCO has committed to assess these key variables at study sites distributed across the ownership. Thus, PALCO's monitoring program will provide the data to determine whether habitat conditions on the ownership trend toward the key properly functioning condition values identified in the agency matrix for these variables. PALCO's adaptive management program, in turn, provides for additional study/analysis and evaluation of the adequacy of the aquatic conservation measures in this Plan for circumstances where habitat conditions do not trend toward the key properly functioning conditions in the matrix. Adaptive management also provides for modification of the Plan measures, as needed, to ensure that habitat conditions trend toward the habitat goals.

d. Measures for Timber Operations

PALCO's HCP measures for timber operations, as they relate to aquatic resources, emphasize new management strategies for riparian forests, and development of appropriate harvest prescriptions for portions of the ownership at high risk of surface erosion and mass wasting. These measures include actions for Channel Migration Zones (CMZ), buffers along Class I and II streams, equipment limitations along Class III streams, and upslope erosion hazard management.

1) Channel Migration Zone

CMZ evaluations will be conducted as part of the DNR watershed analyses that are planned for each basin on the ownership. All segments of Class I and Class II streams that have a Rosgen type C, D or E channel morphology will be examined to identify the current boundaries of the bankfull channel and the remaining portion of the floodplain that is likely to become part of the active channel during the 50 years covered by the ITP as evidenced by past channel migration and other field indicators. Areas not evaluated in a watershed analysis must be analyzed separately by PALCO using a qualified fluvial geomorphologist before any THP that includes CMZ areas can be approved. Additionally NMFS, CDFG, USFWS, and EPA or NCRWQCB will be consulted regarding any such mapping.

a) Within CMZs

1. Management will be allowed under two cases. The first case will be to enhance and facilitate riparian functions (e.g., canopy or LWD levels) based upon a completed watershed analysis and Riparian Management Plan as agreed upon by the permitting agencies. The second will be in cases of emergencies which could result in the loss of life or property, and in cases of emergencies as per agreement with NMFS, USFWS, and CDFG. Loss of property is defined as a demonstrated high risk of loss of capital improvements such as bridges, roads, culverts, and houses, however, it does not include loss of vegetation.

2. No herbicides or pesticides will be used in the CMZ. Fertilizer will be used only for ground application for erosion control only. Aerial fertilization will be excluded from the CMZ.

3. No sanitation salvage or exemption harvest, including emergency exemption harvest, (as defined and allowed in the FPRs) will be allowed in the RMZ, except as per agreement with NMFS, FWS, and CDFG in accordance with the approved HCP

2) Class I Stream Buffers

All fish bearing (or restorable) Class I streams will have a Riparian Management Zone (RMZ). The RMZ will measure 170 ft (slope distance) from the watercourse transition line as defined in the FPRs or outside CMZ edge (if a CMZ is present), on each side of the watercourse. Willows will not be considered permanent vegetation for the purpose of determining the location of the watercourse transition line. The RMZ for Class I streams is divided into three management bands, the Restricted Harvest Band (RHB), the Limited Entry Band (LEB) and the Outer Band (OB). The bands are measured 0 ft to 30 ft, 30 ft to 100 ft, and 100 ft to 170 ft from the watercourse transition line as defined in the FPRs or outside CMZ edge (if a CMZ is present), respectively.

a) Prescriptions for Entire Class I RMZ

1. After each entry, PALCO will retain an additional 10 trees greater than 40 inches DBH per acre on each side of the watercourse. The trees can be counted entirely or partially within the RHB. If trees of this size are not available, the 10 largest trees in the RMZ will be retained.

2. No sanitation salvage or exemption harvest, including emergency exemption harvest, (as defined and allowed in the FPRs) will be allowed in the RMZ, except as per agreement with NMFS, USFWS, and CDFG in accordance with the approved HCP.

3. All portions of down wood (i.e., LWD) except as defined as slash in the FPA or within Class I OBs as specified below will be retained.

4. Trees felled during current harvesting operations and THP-approved road construction are not considered down wood for purposes of retention.

5. Felled hazard trees or snags not associated with a THP are considered down wood and are to be retained in the general vicinity.

6. Trees that fall naturally onto roads, landings, or harvest units within the RMZ are considered down wood and are to be retained in the general vicinity.

7. All non-hazard snags will be retained, as per the snag policy in the HCP.

8. The RMZ is an equipment exclusion zone (EEZ) for timber operations, except for roads and permitted equipment crossings.

9. No herbicides or pesticides will be used within the RMZ. Fertilizers will be used for ground application for erosion control only. Aerially-applied fertilizers will not be directly applied to Class I RMZs.

10. Full suspension yarding will be used when feasible. Full suspension is not feasible on flat ground, in other sites with limited deflection, where an adjacent landowner will not provide permission to secure a cable, or where a full suspension yarding system would jeopardize the safety of field personnel. For these conditions, yarding will be conducted in a manner that avoids ground disturbance that may deliver sediment to a watercourse to the maximum extent practicable. Where ground disturbance occurs PALCO will treat (e.g., through seeding, mulching, etc.) all sites with exposed mineral soil that can reasonably be expected to deliver sediment to a watercourse (e.g., gullies, ruts).

11. Trees may be felled within the RMZ to provide clearance for cable yarding corridors. Such felling will be done only as needed to ensure worker safety. In such cases, to the extent possible given site conditions and the FPRs, trees will be felled toward the watercourses to provide LWD. Regardless, trees felled within the WLPZ for safety purposes will be retained as down wood.

12. Trees not marked for harvest which are damaged in the cable yarding corridors must be retained in place, either standing or as down wood.

13. There will be a maximum of 1 entry every 20 years.

b) Prescriptions for Class I RHB

1. Harvest to enhance and facilitate riparian functions, such as canopy or LWD levels, may be allowed within the RHB based upon a completed watershed analysis and Riparian Management Plan as agreed upon (both processes) by the permitting agencies.

2. Watershed analysis and/or PWA protocol (see section on watershed analysis) will be used to determine the priorities and road storm-proofing standards to be used on all existing haul roads and stream crossings.

3. Road segments within the RHB must be mitigated by extending the RHB on the opposite side of the watercourse from the existing road an equivalent distance of that portion of the road prism within the RHB. In the case of RMZ road crossings, the first 50 ft of road extending inland from the watercourse transition line as defined in the FPRs (14 CCR 895.1) is exempt from this mitigation.

c) Late Seral, High Residual Prescriptions for Class I LEB

1. Only single-tree selection will occur within the LEB.

2. Harvest will only occur if there is a preharvest conifer basal area of 345 sq ft per acre or greater within the LEB.

3. A minimum 300 sq ft post-harvest conifer basal area per acre will be retained within the LEB (see Table 17).

4. Basal area measurements will be made for conformance every 200 ft lineal segment of RMZ.

5. No more than 40 percent of the conifer basal area may be harvested in a single entry.

6. Tree sizes and quantity distribution will be retained as per Table 17. If replacement size classes must be used to obtain the stated size distributions, the replacement size class must come from higher size classes if such trees are available; provided, however, that the largest trees in the stand must be left and harvesting conducted in a manner that facilitates and expedites development of stand conditions stated in Table 17.

7. Watershed analysis and/or the PWA road storm-proofing protocol will be used to determine the priorities and road storm-proofing standards to be used on all roads inside the LEB. Surface area covered in roads will be included in all calculations of basal area.

Table 17 Residual Basal Area (BA) Requirements		
300 sq ft/acre BA		
DBH Class	**Basal Area Percent**	**# of Trees Per Acre***
6 to 12"	5%	34
12 to 18"	10%	24
18 to 24"	15%	19
24 to 30"	15%	11
30 to 36"	15%	8
36 to 42"	20%	7
42 to 48"	20%	5
Over 48"	0%	0
240 sq ft/acre BA		
DBH Class	**Basal Area Percent**	**# of Trees Per Acre***
4 to 8"	3%	37
8 to 12"	4%	18
12 to 16"	8%	18
60 to 20"	10%	14
20 to 24"	12%	11
24 to 28"	12%	9
28 to 32"	15%	7
32 to 36"	18%	7
36 to 40"	18%	5
Over 40"	0%	0
* Retention requirements are based on basal area not tree number. Number of trees/acre provided for information purposes only.		

d) Late Seral Prescriptions for Class I OB

1. Only single-tree selection will occur within the OB.

2. Harvest will only occur in the OB if there is a preharvest conifer basal area of 276 sq ft per acre or greater within the OB.

3. A minimum 240 sq ft post-harvest conifer basal area per acre of OB will be retained on each side of the watercourse.

4. No more than 40 percent of the conifer basal area may be harvested in a single entry.

5. Tree sizes and quantity distribution will be retained as per Table 17. If replacement size classes must be used to obtain the stated size distributions, the replacement size class must come from higher size classes if such trees are available; provided, however, that the largest trees in the stand must be left and harvesting conducted in a manner that facilitates and expedites development of stand conditions stated in Table 17.

6. Basal area measurements will be made for conformance every 200 ft lineal segment of RMZ.

7. In areas with slopes less than 50 percent, portions of downed wood (i.e., LWD) can be removed from the OB. That is, if a tree originating in any of the 3 Bands falls, portions in RHB and LEB must be retained onsite in place, but the portions in the OB can be removed for slopes less than 50%.

8. In areas with slopes 50 percent or greater, all down wood (i.e., LWD) except as defined as slash in the FPA must be retained.

3) Class II Stream Buffers

All non-fish bearing (Class II) streams as defined in the FPRs will have a RMZ. The Class II RMZ will measure 100 ft (slope distance) from the watercourse transition line as defined in the FPRs or outside CMZ edge (if a CMZ is present), on each side of the watercourse. Willows will not be considered permanent vegetation for purpose of determining the location of the watercourse transition line. The RMZ is divided into two management bands, the Restricted Harvest Band (RHB), and the Selective Entry Band (SEB), which are measured from the watercourse transition line as defined in the FPRs or CMZ (if a CMZ is present), 0 ft to 10 ft, and 10 ft to 100 ft, respectively.

a) Prescriptions for Entire Class II RMZ

1. No sanitation salvage or exemption harvest, including emergency exemption harvest, (as defined and allowed in the FPRs) will be allowed in the RMZ, except as per agreement with NMFS, FWS, and CDFG in accordance with the approved HCP.

2. All portions of down wood (i.e., LWD) will be retained, except as defined as slash in the FPA.

3. Full suspension yarding will be used when feasible. Full suspension is not feasible on flat ground, in other sites with limited deflection, where an adjacent landowner will not provide permission to secure a cable, or where a full suspension yarding system would jeopardize the safety of field personnel. For these conditions, yarding will be conducted in a manner that avoids ground disturbance that may deliver sediment to a watercourse to the maximum extent practicable. Where ground disturbance occurs PALCO will treat (e.g., through seeding, mulching, etc.) all sites with exposed mineral soil that reasonably can be expected to deliver sediment to a watercourse (e.g., gullies, ruts).

4. Trees felled during current harvesting and approved THP road construction are not considered down wood for purposes of retention.

5. Felled hazard trees not associated with a harvesting operation or road are considered down wood and are to be retained in the general vicinity.

6. Trees that fall naturally onto roads, landings, or harvest units are considered down wood and are to be retained in the general vicinity.

7. Trees not marked for harvest may be felled within the RMZ to provide safety clearance for cable yarding corridors. Such felling will be done only as needed to ensure worker safety. In such cases, to the extent feasible given site conditions and the FPRs, trees will be felled toward the watercourses to provide LWD. Regardless, trees felled within the WLPZ for safety purposes will be retained as down wood.

8. Trees damaged in the cable yarding corridors must be retained in place.

9. The RMZ is an EEZ for timber operations, except for roads and permitted equipment crossings.

10. No herbicides or pesticides will be used within the RMZ. Fertilizers will be used only for ground application for erosion control only.

b) Prescriptions for Class II RHB

1. Management to enhance and facilitate riparian functions such as canopy or LWD levels, may be allowed within the RHB based upon a completed watershed analysis and Riparian Management Plan as agreed upon (both processes) by the permitting agencies.

2. If the 10 ft line falls anywhere on a tree bole, the tree is to be retained as part of the RHB.

3. Watershed analysis and/or the PWA road storm-proofing protocol will determine the priorities and road storm-proofing standards to be used on all existing haul roads and stream crossings.

4. Road segments within the RHB must be mitigated by extending the RHB on the opposite side of the watercourse from the existing road an equivalent distance of that portion of the road prism within the RHB. In the case of RMZ road crossings, the first 15 ft of road extending inland from the watercourse transition line as defined in the FPRs (14 CCR 895.1) is exempt from this mitigation.

c) Late Seral Prescriptions for Class II SEB

1. Only single-tree selection will occur within the SEB.

2. Harvest will only occur in the SEB if there is a preharvest conifer basal area of 276 sq ft per acre or greater within the SEB.

3. A minimum 240 sq ft post-harvest conifer basal area per acre of SEB will be retained.

4. No more than 40 percent of the conifer basal area may be harvested in a single entry.

5. Tree sizes and quantity distribution will be retained as per Table 17. If replacement size classes must be used to obtain the stated size distributions, the replacement size class must come from higher size classes if such trees are available; provided, however, that the largest trees in the stand must be left and harvesting conducted in a manner that facilitates and expedites development of stand conditions stated in Table 17.

6. Basal area measurements will be made for conformance every 200 ft lineal segment of RMZ.

7. There will be a maximum of 1 entry every 20 years.

8. Watershed Analysis and/or PWA protocol will be used to determine the priorities and road storm-proofing standards to be used on all roads inside the LEB. Surface area covered in roads will be included in all calculations of basal area.

4) Class III Stream Buffers

Class III streams will have three management categories based on percent slope, <30%, 30% - 50%, and >50%.

a) Measures for All Class III Buffers

1. There will be no removal of any portion of down wood within the equipment limitation zone (ELZ or EEZ) except for emergencies as per agreement with NMFS, USFWS, and CDFG in accordance with the approved HCP.

2. There will be no removal of down wood in the channel.

3. Trees felled during current harvesting operations and road construction are not considered down wood for purposes of retention.

4. Felled hazard trees not associated with a harvesting operation or road are considered down wood and are to be retained in the general vicinity.

5. Trees that fall naturally onto roads, landings, or harvest units are considered down wood and are to be retained in the general vicinity.

6. No prescribed fire shall be ignited within the ELZs or EEZs.

b) Measures for Class III Buffers with Slopes <30 Percent

1. ELZ extending 25 ft from the stream edge, or to the drainage divide, or ridgeline of the Class III stream whichever is less.

2. Stabilize skid trails as per the FPRs (Section 916.7) or as per an approved THP.

3. Ground based equipment in the ELZ is acceptable if less resource damage will occur by operating in the ELZ, as per an approved THP.

4. Where the above measure applies, all tractor road watercourse crossings must be flagged on the ground prior to the preharvest inspection and shown on the THP map in order to be adequately evaluated for the potential to generate sediment.

c) Measures for Class III Buffers with Slopes 30-50 Percent

1. ELZ extending 50 ft from the stream edge, or to the drainage divide, or ridgeline of the Class III stream whichever is less.

2. Stabilize skid trails as per the FPRs (Section 916.7) or as per an approved THP.

3. Ground based equipment in the ELZ is acceptable if less resource damage will occur by operating in the ELZ, as per an approved THP.

4. Where the above measure applies, all tractor road watercourse crossings must be flagged on the ground prior to the preharvest inspection and shown on the THP map in order to be adequately evaluated for the potential to generate sediment.

d) Measures for Class III Buffers with Slopes >50 Percent

1. EEZ extending 100 ft from the stream edge, or to the drainage divide, or ridgeline of the Class III stream whichever is less.

2. Ground based equipment in the EEZ is acceptable if less resource damage will occur by operating in the EEZ, as per an approved THP.

3. Where the above measure applies, all tractor road watercourse crossings must be flagged on the ground prior to the preharvest inspection and shown on the THP map in order to be adequately evaluated for the potential to generate sediment.

e. Measures for Other Plan Area Activities

1) Gravel Mining

As noted in the description of Covered Activities, PALCO will continue to mitigate impacts from gravel mining in accordance with the measures specified in the COE LOP.

2) Rock Quarrying

PALCO will continue to use detention ponds and erosion control structures to reduce impacts on creeks or riparian areas resulting from hardrock mining on the property. No new measures are proposed here.

Impacts from quarry operations will be assessed as part of the watershed analysis under the Aquatics Species Conservation Plan. As part of that assessment, all existing pits and quarries will be mapped and analyzed. New pits and quarries will be mapped when constructed.

3) Grazing

PALCO will limit grazing in the Plan Area to no more than 1000 head at any one time during the Plan period. In addition, cattle access to streams may be limited via fences, and by locating salt and water sources in pastures away from riparian areas. Grazing in specific watersheds also will be evaluated as part of the watershed analysis process. Prior to that analysis, PALCO will prepare topographic maps showing the specific location of the grazing areas in relationship to streams and drainages and will provide copies of the maps to NMFS, USFWS, and CDFG. If the watershed evaluations indicate that grazing is having an adverse effect on aquatic resources, additional mitigation measures will be utilized during the prescription writing phase of watershed analysis. Mitigating prescriptions that could be used are: fencing of streams to prevent access, rotation of periods of grazing with periods of rest, provision of alternate sources of water (other than watercourses), and cessation of all grazing activities.

4) Instream Habitat Improvements

Extensive mitigation measures are already required to reduce short-term impacts associated with stream restoration activities. These include:

- Moving fish away from construction sites
- Keeping heavy equipment out of the stream unless necessary and then limiting work to summer months
- Keeping equipment clean of diesel and oil and having petroleum product absorbent material at the work site
- Re-establishing riparian vegetation where it has been disturbed
- Seeding and straw-mulching bare soil
- Installing silt catchment fences during construction

No additional mitigation measures are proposed for the instream fish habitat improvements.

5) Fish Rearing Facilities

PALCO's fish rearing facilities are being used, and will continue to be used, primarily to aid in the establishment of self-sustaining populations of wild fish. Thus, the facilities will only be used as long as they are thought to be having a positive impact on wild fish populations. To increase the chances that the overall effect of the facilities is positive, PALCO has depended in the past on guidance from fisheries biologists within CDFG to determine the best operational methods. This cooperation/collaboration has extended to yearly agency review of the facilities' operations, adoption by PALCO of CDFG recommended operation and release schedules, and releasing hatchery fish into stream reaches that had been improved through the State-PALCO cooperative program in stream restoration. By keeping the scale of operations low, depending on wild fish for eggs/milt, and limiting adult captures and juvenile releases to a single basin (Yager Creek), PALCO has limited the potential negative impacts of its program to a minimum; remaining adverse effects are mitigated by the positive effects of fish rearing.

Under the ITP, the incidental taking of non-targeted listed species will be allowed in connection with the fish rearing activities (e.g., coho salmon may be unintentionally trapped, captured or taken in the course of collection of unlisted species during the otherwise lawful activities). Targeting listed species for collection will require an ESA section 10(a)1(A) permit.

6) Burning

PALCO will continue to utilize protection practices for managing prescribed burns (including brush piling, fire breaks, ignition techniques, prescriptions for environmental conditions permitting ignition, etc.). PALCO will not be required to mitigate for the effects of an escaped control burn or a wildfire unless PALCO or its agents are found in violation of or out of compliance with their burning permit.

A variety of measures are used to prevent prescribed fires from escaping into and burning riparian areas. These include limiting burns to spring and fall periods when moisture levels are high, using fuel breaks, setting fires so that they burn downhill toward the riparian zone, and avoiding any ignition in Class I/II WLPZs. Additional discussion of measures to protect riparian areas from prescribed burns is presented in the Aquatic Species Conservation Plan in Volume IV.

f. Measures as Applied to List A Fish Species

For additional detail regarding measures for and effects on List A fish species, see Part D of Volume IV.

1) Chinook Salmon

Measures within the Plan are expected to have a substantial positive impact on chinook salmon populations on PALCO's ownership as a result of the expected reduction in fine sediment input from roads and harvest activities, increased recruitment of LWD through increased retention of large, nearbank, riparian trees; and stabilization of streambanks. A reduction in fine sediment input and an increase in LWD input would offer several benefits to chinook salmon including decreasing percent fine material, increasing or stabilizing sediment size D_{50}, and increased frequency and maximum depth of deep water areas.

2) Coho Salmon

Measures within the Plan are expected to have a substantial positive impact on coho salmon populations on PALCO ownership. Coho salmon juveniles generally reside within streams for a year or more, and are particularly dependent upon instream cover, deep water areas, and cold water temperatures. Plan measures are expected to benefit coho survival due to increased retention of large, near channel riparian trees and reduction in sediment inputs from roads and harvest activities. PALCO recognizes that providing adequate LWD levels in ownership streams is particularly important for coho survival. Increased retention of riparian trees will benefit coho survival by increasing the frequency and complexity of pool habitats and by providing streamside shade for control of water temperature. A reduction in fine sediment input would benefit coho salmon by decreasing percent fine material in spawning gravels and by reducing aggradation of pool areas. These measures are expected to result in increased juvenile rearing habitat, and adult holding habitat, reduced fine sediment levels, moderate water temperatures, and increases in both the quantity and quality of coho spawning gravels.

3) Coastal Cutthroat Trout

Measures within the Plan are expected to have a substantial positive impact on both anadromous and non-anadromous populations of cutthroat trout on PALCO's ownership (Table 6). Increases in deep water habitat, instream cover, and improved spawning gravel conditions will all enhance production of this species. Because juvenile cutthroat trout reside within streams for several years (sea-run) or permanently (resident cutthroat), these habitat improvements will affect a significant portion of the life history of this species. In addition, many of the positive impacts affecting steelhead and rainbow trout will also play important roles in the life history of cutthroat trout.

4) Steelhead Trout

Measures within the Plan are expected to have a substantial positive impact on steelhead/rainbow trout populations on PALCO's ownership. Although less dependent on pools and instream cover than coho, steelhead and rainbow trout will still benefit from improvements in deep water areas, cover, and LWD loading. In addition, given their multi-year (steelhead) or permanent (rainbow) residency within streams, these improvements will affect a significant portion of the life cycle of these species. Although all of the measures are assumed to have a positive effect on steelhead and rainbow trout, the retention of riparian trees is anticipated to have the greatest effect. Mature riparian trees will provide thermal insulation and maintain LWD loading, which in turn will provide cover and pool habitat.

5) Pacific Lamprey

The Plan is expected to have at least some negative consequences for Pacific lamprey because this species' juveniles rear in areas with sand and silt substrates. However, the Plan should reduce the abundance of these substrate types in many streams, and the reductions in stream sediment levels will increase the quality of spawning areas used by Pacific lamprey. This should lead to increased survival rates of eggs and young juveniles. In addition, extensive areas with sand and silt substrates are available in the lower reaches of many streams (i.e., downstream of PL's ownership). Consequently, rearing habitat for Pacific lamprey is not expected to be substantially decreased as a consequence of this Plan. Increased shading levels in riparian zones if the Plan is implemented would reduce the abundance of aquatic vegetation. However, many of the streams on the ownership have downstream sections off the ownership that are characterized by low gradients, limited overhead canopy, and sand/silt substrates (e.g., Freshwater Creek, Elk River). These areas are likely the most important habitats for the lamprey already, especially given the proximity of these areas to estuarine habitat. If the Plan is implemented, the importance of these habitats would increase.

6. Measures for Other List A Wildlife

Part E of Volume IV provides a species-by-species consideration of impact avoidance, impact mitigation, habitat conservation, and monitoring measures for other List A Wildlife Species. In general, other List A wildlife will benefit from the measures implemented for the Focus Species and the habitat-based measures in the Plan. For purposes of this summary, only species-specific measures for other List A wildlife are described here. Table 18 provides a summary list of other plan measures applicable to the species.

a. Riparian Dependent Amphibians and Reptiles

For the southern torrent salamander, tailed frog, red legged frog, foothill yellow-legged frog, and northwestern pond turtle, monitoring and adaptive management measures will be implemented in connection with the watershed analysis and other provisions of the Aquatics Species Conservation Plan. These species are dependent on riparian areas for various stages of their life history, and as a group, have specific habitat requirements that are addressed by the aquatic conservation strategy. These requirements include but are not limited to:

- Cool air temperatures (<22^{o} C)
- Cool water temperatures (5^{o} C to 17.2^{o} C)
- Soil temperature of <14^{o} C
- Relative humidity >40%
- LWD in the stream channel and in the riparian zone
- Clean, undisturbed gravel and cobble
- Limited disturbance within 5 meters of the stream bank

The RMZ provisions of the Plan for no cut and late seral zones will be effective in maintaining stable air and soil temperatures as well as maintaining suitable relative humidity levels. Protection of channel migration zones is highly likely to ensure that important rearing habitat for these species is conserved. High canopy cover levels in the RMZ will protect water temperatures from rising.

The aquatic conservation strategy also provides for extensive recruitment of LWD in streams, channels and within riparian forests. LWD in the stream channel will provide cover for egg masses, larvae, and adults. Down wood in the riparian zone will provide habitat for adults. In addition to natural introduction of LWD, fish habitat improvement projects frequently add LWD and rootwads to the stream channel. Overall, the establishment of RMZs and retention of LWD will maintain the microclimate and microhabitats desired by amphibians. A combination of efforts will work towards providing clean, undisturbed gravel and cobble for amphibian use. By keeping equipment out of the wetted channel during gravel extraction, disturbance to the amphibians in the stream channel will be limited. The roads and mass wasting strategy will prevent introduction of large quantities of sediment, including fine sediments that fill the interstitial spaces necessary for egg survival. The width of the RMZs will also provide for fine sediment settlement from runoff. Finally, extensive sediment monitoring will be conducted to ensure that fine sediment mitigrations are effective. This combination of actions will only increase the availability of clean, undisturbed gravel and cobble for amphibians.

Within the RMZ, 30’ of the Class I and 10’ of the Class II stream buffers will be designated as RHBs. The only activity allowed here is harvest to enhance and facilitate riparian functions. In most cases, this means that the zone will remain undisturbed. All three of these species of amphibians tend to be found very close to the stream channel. No activity within the RHB should eliminate the possibility of direct impact on amphibians due to equipment and harvest activity.

Table 18
General Categories of SYP/HCP Measures Applicable to Other List A Wildlife

Species	Conserve Habitat in Headwaters Reserve	Conserve Habitat in MMCAs	Maintain Habitat Diversity	Recruit/ Retain Snags	Retain Hardwood	Retain Downed Logs	Road Measures	RMZ Measures	Recruit/ Retain Instream LWD	Stream Habitat Enhance-ment	Gravel Mining Measures	Survey and Monitor
Amphibians and Reptile												
Southern torrent salamander	X	X				X	X	X	X	X		X
Tailed frog	X	X				X	X	X	X	X		X
Red-legged frog	X	X				X	X	X	X		X	X
Foothill yellow-legged frog						X	X	X	X	X	X	X
Northwestern pond turtle						X	X	X	X	X	X	X
Birds												
Double-crested cormorant				X	X			X			X	X
Great blue heron			X	X				X			X	X
Great egret			X	X				X			X	X
Snowy egret			X	X				X			X	X
Black-crowned night heron				X				X			X	X
Osprey	X	X		X				X		X	X	X
Bald eagle				X				X		X	X	X
Sharp-shinned hawk	X	X	X	X	X	X		X				X
Cooper's hawk	X	X	X	X	X	X		X				X
Northern goshawk	X	X	X	X	X	X			X			X
Ferruginous hawk			X									X
Golden eagle			X	X								X
American peregrine falcon								X				X
Western snowy plover								X			X	X
Burrowing owl			X									X
Vaux's swift	X	X	X	X	X			X	X			X
Pileated woodpecker	X	X	X	X	X	X			X			X
Purple martin	X	X	X	X	X			X				X
Bank swallow								X				X
Yellow warbler			X		X		X	X				X
Yellow-breasted chat			X		X		X	X				X
Mammals												
California red tree vole	X	X	X	X				X	X			X
Humboldt marten	X	X	X	X	X	X		X	X			X
Pacific fisher	X	X	X	X	X	X		X	X			X

Besides these measures being taken on Class I and II streams, Class III streams have protections that will also be beneficial to amphibians. Measures applied to all Class III streams include no fire ignition within 25' of the stream edge, no removal of down wood, and equipment limitation zones within 25' of the stream edge. Additional measures are applied based on the side slopes of the stream. Overall, the aquatic conservation strategy has a high probability of having significant positive impacts on covered amphibian and reptiles, providing for greater habitat quantities and quality, and a significant reduction in disturbance levels compared to those permitted under existing rules.

b. Heron and Egret Rookeries and Nest Sites

Monitoring for the List A herons and egrets will continue through bird surveys conducted on the PALCO gravel bars and reconnaissance level surveys for eagles and osprey. If individual nest sites or rookeries are identified in a THP area, a seasonal buffer of a 300' radius from the nest tree or trees will be implemented during the critical period (March 15 through July 15). Following the critical period, or fledging of young, limited harvest is allowed in the buffer zone (such as thinning or selection). The nest trees and screening trees will be left. These default measures may be altered to fit site specific conditions through consultation with USFWS or CDFG.

c. Osprey Nest Sites

Active nest sites in THP areas or adjacent to THP areas will be protected by buffers up to 18 acres in size. All designated nest, perch, and screen trees will be left standing and unharmed during the nesting season, or until it has been determined the young have fledged. After the nesting season, or when young have fledged, the nest zone may be harvested, although the nest tree shall be left. Burning of units for site preparation shall be done outside the nesting season, and measures such as firelines, foaming, or others to protect the nest tree shall be taken. The nest tree, especially if it is a snag, may still burn. PALCO, at its option, may propose the construction of an artificial nest structure. Known sites and any other new nest sites found during the life of the permit will be periodically monitored during the nesting season to determine if the nest is active, or if the default measures are effective.

d. Wintering and Nesting Bald Eagles

Watercourse protection zones and the retention of large trees for woody debris and snag recruitment will serve to provide perches for foraging eagles. These same mitigation measures are proposed to maintain, and enhance conditions for the prey species of the wintering birds. In the event that bald eagles attempt to nest in the Plan Area, it is anticipated that these measures will also provide suitable nesting substrates. Special measures will be implemented to avoid and minimize impacts to wintering bald eagles and nest sites.

1) Measures for Wintering Bald Eagles

When operating in or adjacent to known or potential foraging habitat as shown on Map 31 during the period when wintering bald eagles occur in the Plan Area (generally between 15 November and 15 February), PALCO will adhere to the following measures.

1. Skyline cables over Class I streams will be marked to reduce the probability of collisions. The procedure for marking skyline cables will be approved by the USFWS or CDFG.

2. Designated field personnel (Licensed Timber Operator, Registered Professional Forester, or wildlife biologist) will be trained to recognize and survey for bald eagles. The training procedure will be approved by USFWS or CDFG.

3. Known or potential foraging habitat adjacent to THP will be surveyed each morning prior to harvest operations. A survey protocol will be approved by USFWS or CDFG.

4. If bald eagles are present adjacent to the THP, there will be no active operations within the WLPZ or within 100' of the WLPZ while eagles are present.

2) Measures for Nesting Bald Eagles

1. Annual reconnaissance surveys. PALCO will conduct annual reconnaissance level surveys to identify watersheds where THP specific surveys are needed. The surveys will consist of visits to observation points along roads or other viewing locations which cover the areas depicted as known or potential foraging habitat on Map 31. The surveys will be conducted during the pre-breeding season (February 15 to March 15). Observation points along the transects will be established no greater than 0.5 miles apart. Surveyors will spend a minimum of ten minutes at each station, and search for bald eagles and other raptors using binoculars, or a spotting scope if necessary. Transects will be run a minimum of three times each, with two runs occurring in the morning (sunrise to 1100), and one in the afternoon/evening (1400 to sunset). At least one run for each transect must be conducted in March. All pertinent observations will be recorded. If reconnaissance level surveys are negative, no THP specific surveys are needed. If eagles are detected during the March survey, THP level surveys and actions will be initiated.

2. THP level surveys and actions. If there is a Class I stream within 1.0 mile of the THP, surveys will be conducted to detect any nesting eagles within 0.5 miles of the THP boundaries. If bald eagles are not detected, no protective measures are warranted. If nesting bald eagles are detected:

   a) Seasonal no harvest buffers around nests will be maintained during the breeding season (January 15 to August 15, or post fledging); the default buffers will be a distance of 0.5-mile radius from the nest tree. Where mitigating topographic features or other site specific circumstances may warrant a change in the default buffers, PALCO will consult with the USFWS or CDFG.

   b) If there are nesting eagles more than 0.25 mile but less than 0.50 mile from the THP boundaries, a PALCO wildlife biologist will observe the nest for at least one hour during each of the first three days of timber operations to determine if operations are adversely affecting nesting. Indications of disturbance include agitated movements, frequent calling, adults taking flight, or nestlings left unprotected for extended periods of time (>10 minutes).

   c) A 500' radius buffer area of limited harvest shall be implemented post breeding season. Harvest shall be limited to the period between 15 August and 31 October, unless it can be shown that the nest has failed or young have fledged. Harvest within the 500' radius will be limited to prescriptions which will enhance long term eagle habitat; such as: precommercial or commercial thinning, selection, or an alternate prescription.

   d) Any other site specific management measures will be developed in consultation with USFWS and CDFG.

Currently there are no known nests of this species on PALCO lands. Therefore, the THP and annual reconnaissance level surveys described above will serve as monitoring for bald eagles. If a nest is found as a result of the surveys, the protection measures will be monitored for compliance and effectiveness. Data gathered shall be reported to the USFWS and CDFG.

e. Sharp-shinned and Cooper's Hawks

During the first five years of the ITP PALCO will survey for sharp-shinned hawks and Cooper's hawks in approximately 10% of the total proposed THP acreage, comprised of a representative sample of the habitats involved. Methodology similar to the 1996 Mosher and Fuller protocol or 1988 Rosenfield protocol will be used. Broadcast calls of species such as great-horned owls will not be used within 0.5 miles of known spotted owl sites. Training of foresters and technicians in identification of sharp-shinned hawks and Cooper's hawks and their nests will be conducted to minimize impacts in unsurveyed THPs. A 500' operational buffer will be implemented around active nests in or adjacent to a THP. Harvest of the buffer (with the exception of the nest tree) outside of the nesting season, or following a determination that the young have fledged, is authorized. Following the first five years of surveys, a predictive model will be developed using information collected to guide future surveys.

f. Northern Goshawk

Surveys of THP areas in habitats of potentially high suitability (i.e. Douglas-fir, hardwood, or Montane Hardwood Conifer in the Bear-Mattole WAA) will follow Goshawk Working Group (1995) guidelines. Broadcast calls of goshawks will not be used within 0.5 miles of a northern spotted owl activity center. During the first five years of the permit period, all THPs in the Bear-Mattole WAA shall be surveyed. A training program for foresters and technicians involved in THP work shall be conducted to enable these field crews to recognize and protect goshawk nests, both in the Bear-Mattole WAA and all other WAAs. If a nest site is found in or within 1,000' of a THP area, a 1,000' radius protective buffer will be maintained around the nest site during the nesting season or until 30 days after the young have fledged. Following the nest season or after the young have fledged the buffer may be harvested. Following the first five years of the ITP, either a reduced survey regime will be implemented, or a predictive habitat model produced to direct future surveys.

g. Golden Eagle

Maintaining habitat diversity over time is likely to provide nesting habitat as well as habitat for prey species of the golden eagle. Guidelines for snag retention and recruitment will contribute to the maintenance of potential nest trees. Surveys and nest site protections are as follows:

1. When a THP is proposed in potentially suitable nesting habitat for this species (for example in the mixed prairie, Douglas-fir, and hardwood habitats of the Bear-Mattole WAA), a staff wildlife biologist will survey the THP area and surroundings for evidence of nesting. The THP area and a 0.25 mile buffer will be surveyed for ground based operations, or a 0.5 mile buffer for helicopter operations. Ground based surveys shall consist of three survey visits between 15 January and 1 March. Surveys shall occur in the morning prior to 1100 hours, or in the afternoon after 1400 hours, and shall have a minimum two hour duration. Surveys shall occur at least five days apart, and will not be conducted during inclement weather. Surveys from aircraft may take the place of the ground based surveys.

2. If a nest is found in or adjacent to an area proposed for harvest, buffer zones will be implemented as follows:

    a) Seasonal no harvest buffers around nests will be maintained during the breeding season (January 15 to August 15, or post fledging); the default buffers will be a 0.5-mile radius from the

nest tree. Where mitigating topographic features or other site specific circumstances may warrant a change in the default buffers, PALCO will consult with the USFWS or CDFG.

b) If there are nesting eagles more than 0.25 mile but less than 0.50 mile from the THP boundaries, a PALCO wildlife biologist will observe the nest for at least one hour during each of the first three days of timber operations to determine if operations are adversely affecting nesting. Indications of disturbance include agitated movements, frequent calling, adults taking flight, or nestlings left unprotected for extended periods of time (>10 minutes).

c) A 500' radius buffer area of limited harvest shall be implemented post breeding season. Harvest shall be limited to the period between 15 August and 31 October, unless it can be shown that the nest has failed or young have fledged. Harvest within the 500' radius will be limited to prescriptions which will enhance long term eagle habitat; such as: precommercial or commercial thinning, selection, or an alternate prescription.

d) Any site specific protection measures other than defaults above will be developed in consultation with USFWS and CDFG.

Currently there are no known nests of this species on PALCO lands. Therefore, the THP surveys described above will serve as monitoring for golden eagles. If a nest is found as a result of the surveys, the protection measures will be monitored for compliance and effectiveness. Data gathered shall be reported to the USFWS and CDFG.

h. American Peregrine Falcon

The following mitigation strategy shall be followed to avoid adverse impacts:

1. For THPs greater than or equal to 0.5 miles from the Scotia Bluffs or Holmes Bluff, and any other cliffs identified as potential nest sites, no site specific surveys, monitoring, or consultation are needed.

2. For THPs < 0.5 mile from the Scotia Bluffs or Holmes Bluff, and any other cliffs identified as potential nest sites, apply default mitigations, or monitor for occupancy each year during the breeding season (January 15 to August 15). Default mitigations shall be applied until monitoring allows other determinations developed in consultation with USFWS or CDFG.

3. Default mitigation includes a disturbance buffer of 0.25 miles of no harvest for tractor or cable yarding operations, or 0.5 miles for helicopter yarding operations. The disturbance buffers shall be applied during the January 15 to August 15 breeding period.

4. Site specific measures to avoid impacts may be applied to the Scotia Bluffs or Holmes Bluff sites, and any other cliffs identified as potential nest sites, in consultation with USFWS or CDFG. An example of this type of mitigation is the restriction on the use of "jake brakes" on a portion of the county road north of Holmes Bluff during the breeding season.

5. Lifting of the default mitigations or other site specific restrictions can be accomplished through monitoring and the determination that the site is not occupied, that nesting is not occurring, has failed, or that the young have fledged. Monitoring shall be conducted by a qualified biologist and follow the guidelines in Pagel (1992), "Protocol for Observing Known and Potential Peregrine Falcon Eyries in the Pacific Northwest".

6. The RPF, Staff Wildlife Biologist, or their designee shall explain to the person or persons responsible for the conduct of the timber operations the physical and temporal nature of any default or site specific restrictions.

The Holmes Bluff and Scotia Bluff sites, and any other new nest sites found during the life of the permit will be periodically monitored during the nesting season to determine if the nest is active, or if the default measures are effective. Data gathered shall be reported to the USFWS and CDFG at five year intervals.

i. Western Snowy Plover

If snowy plovers are detected, the individual(s) shall be observed for evidence of nesting behavior. If a nest site is discovered, a 1,000' seasonal operations buffer will be applied until the end of the breeding season, or until it is determined that the nest has failed, or nesting has been completed.

j. Burrowing Owl

The following mitigation strategy will be followed for burrowing owls:

1. Where roads are to be constructed through prairies, conduct surveys during both the wintering and nesting seasons, unless the species is detected on the first seasonal survey. The winter survey should be conducted between December 1 and January 31. Nesting season surveys should be conducted between April 15 and July 15. Surveys should be conducted from two hours before sunset to one hour after, or from one hour before to two hours after sunrise. Surveys should effectively cover all suitable burrowing habitat within 50 meters of the road alignment. If surveys are positive, the road shall be designed and constructed to avoid nest burrows by at least 50 meters. Construction must not disturb an occupied burrow during the nesting season (February 1 through August 31) unless a qualified wildlife biologist approved by the USFWS or CDFG verifies through non-destructive methods that either: (1) the owls have not yet begun egg laying and incubation; or (2) that juveniles from the occupied burrows are foraging independently and are capable of independent survival.

2. If surveys are negative but burrowing owls are detected during construction, operations within 50 meters of the nest site shall be avoided until any nestlings are fledged or until August 31, whichever occurs first. After this point, PALCO will notify the USFWS and CDFG and attempt to trap any owls using the burrows to avoid killing them by construction activities. The owls will then be released following construction activities.

Currently there are no known nests of this species on PALCO lands. Therefore, the THP level surveys described above will serve as monitoring for burrowing owls. If a nest is found as a result of the surveys, the protection measures will be monitored for compliance and effectiveness. Data gathered shall be reported to the USFWS and CDFG.

k. Bank Swallow

The following measures will be implemented for bank swallows:

1. PALCO shall try to prevent repeated attempts to nest in sand piles associated with gravel mining operations using netting or other means developed in consultation with USFWS or CDFG.

2. Known or encountered nesting colonies along streams will be avoided during May and June. Establish a 200' buffer around active nest colonies during the nesting season, or consult with the USFWS or CDFG to develop alternative mitigation measures.

3. Riparian management zones will minimize disturbance and other impacts to nest colonies which may be established in the future.

7. Measures for List B Wildlife and Plants

Impacts to List B species will be mitigated by the general protection measures discussed in this Plan, including but not limited to: large habitat set-asides in the Headwaters Reserve and MMCAs, late seral habitat maintenance over time, maintenance of habitat diversity over time, riparian protection measures, and specific mitigation measures for Focus and other List A species. Except for special measures that apply to List B raptors, conservation and mitigation measures for List B species will be incidental to implementation of the measures for List A species.

The special measures for List B raptors are as follows:

1. If the nest of a northern harrier, black-sholdered kite, short-eared owl, or great gray owl is discovered in a THP area or adjacent to a THP area, a 200' no cut buffer will be maintained around the nest tree during the nesting season, or until it can be shown that young have fledged.

2. Following the nesting season or the fledging of young, timber in the buffer area may be harvested, with the exception of the nest tree (applicable to those tree nesting species only).

8. HCP-Related Assurances and Provisions

Implementation of the HCP measures in the Plan will be governed by an agreement (the IA in Volume VI) signed by PALCO, USFWS, NMFS, CDFG, and CDF. In general, the IA reiterates:

- The responsibilities of the parties,

- Terms and conditions attached to approval of the Plan and ITPs,

- The authorizations and assurances provided by the agencies,

- The assurances provided by PALCO regarding the availability of funding for, and PALCO's commitment to, implementation of the Plan,

- Reporting and record keeping requirements, and

- Procedures for amending the Plan, IA, and ITPs.

As required for the ITPs, PALCO also has identified provisions for responding to changes and unforeseen circumstances as currently defined in federal and state regulations. Key provisions are stated in the IA; a detailed discussion of issues regarding changed and unforeseen circumstances in provided in Part H of Volume IV.

9. SYP-Related Measures

In addition to the above measures, PALCO will monitor timber growth and harvest in the Plan Area to ensure that LTSY objectives are attained. LTSY monitoring will entail:

- Updating and maintaining the vegetation inventory,
- Monitoring DI levels in WAAs,
- Monitoring annual harvest levels,
- Monitoring growth in intensively managed units.
- Implementing SYP provisions through the THP process.

a. Updating and Maintaining the Vegetation Inventory

1. Each year, the current inventory will be updated to reflect changes in seral types and northern spotted owl habitat due to timber harvest and growth.

2. Within three years of Plan approval, vegetation types in the Plan Area will be re-inventoried. Thereafter, vegetation types will be re-inventoried every 15 years.

3. As part of the 15-year inventories, PALCO will evaluate: a) the mix of seral and vegetation types property-wide, in WAAs, and in Class I and II WLPZs; b) compliance with the BA, tree size, and canopy cover requirements specified in the streamside protection zone measures for Class I and II buffers; and c) the amount and types (nesting, roosting, foraging) of habitat for northern spotted owls property-wide and in WAAs.

b. Monitoring DI Levels

Using the index developed as part of this Plan, PALCO annually will calculate the DI for each WAA where operations have occurred and report the information to the agencies. The DI for each WAA also will be monitored annually for compliance with the LTSY objective (DI <20%). If annual monitoring indicates that the DI for a WAA exceeds 20%, corrective measures will be proposed by PALCO in consultation with the agencies.

c. Monitoring Annual Harvest Levels

In connection with SYP requirements as well as HCP objectives, compliance with LTSY harvest levels will be monitored annually. Accounting for compliance will commence on the date the Plan is approved.

1) Harvest Volume Measure

The basis for measurement of actual annual harvest levels will be volume reported to the State Board of Equalization for calculation of yield tax payments. This will include total net Scribner short log scale volume measured for the year. For these purposes, merchantable hardwood volume (measured and reported in tons of logs) will be converted to net Scribner short log scale using a conversion factor of 7.5 tons/MBF. Thus, for purposes of compliance with LTSY limitations, annual harvest will equal the sum of the annual volumes harvested during the ten years being evaluated.

2) Land Base Measure

During the course of Plan implementation, it is likely that PALCO's timberland base will change as a result of acquisitions or divestitures. To account for changes in LTSY that will result from changes to the land base, PALCO will calculate an "Actual Annual LTSY" based on land and timber transactions during the preceding year and compare it with the baseline projections in this SYP/HCP. Actual Annual LTSY will be calculated by increasing or decreasing the baseline projections by the growth potential impact of the net land and timber transactions. For each acre acquired or sold, the increase or decease of LTSY will be equal to the LTSY contribution of the land; that contribution will be measured in board feet per year based on site class and the silvicultural regime that would be assigned to the land by the LTSY model. For example, one acre of site class II redwood timberlands managed using prescription 70 (clear cut, 50-year rotation, no commercial thinning, intensive management) contributes 1.35 MBF of annual growth. Acquisition of such an acre would increase (and sale of the acre would decrease) Actual Annual LTSY by 1.35 MBF.

Compliance with the SYP requirement that average annual harvest over a 10-year period not exceed LTSY will be determined by comparing the sum of the Actual Annual LTSYs with the actual annual harvests for that 10-year period. For purposes of this comparison, changes in any calendar year will count toward that year's Actual Annual LTSY if title is transferred anytime during that calendar year.

d. Monitoring Growth in Intensively Managed Units

As a measure of the Plan's effectiveness in producing growth levels that meet LTSY requirements, PALCO will monitor intensively managed clearcut units by auditing the treatments applied to them. The audit will compare actual and target levels of four types of treatment that affect site productivity: site preparation, planting, vegetation control, and precommercial thinning. For purposes of the audit, each of these four treatments is assumed to contribute equally to LTSY growth objectives. Target treatment levels and the audit process are described in Part G of Volume III.

e. Implementing SYP Measures through the THP Process

In general, the relationship between the SYP/HCP and individual THPs will be as follows:

1. Information in the SYP/HCP will be used to answer THP form questions.

2. Site management on the THP level must conform to SYP/HCP projections, guidelines, and requirements.

3. The measures identified in the SYP/HCP for the HCP Species will be the impact avoidance and mitigation measures for those species.

4. The SYP/HCP will be the statement of long-term objectives for late successional forests in the plan area, and the measures identified in the SYP/HCP will be the mitigation measures for impacts to late successional forests.

5. The assessments and related measures that will be implemented as part of the Plan will be the cumulative impact assessment for the THP; no further analysis of cumulative effects will be required for individual THPs.

6. The protection measures for WLPZs are identified in the SYP/HCP.

7. The measures in the SYP/HCP represent interim prescriptions that may be modified for portions of PALCO's ownership after completion of the watershed analysis described in the Aquatic Species Conservation Plan.

Part H in Volume III describes the specific relationship between the information and analysis in the SYP/HCP and THP requirements.

Glossary

Abbreviations

ACD	Angular canopy density
ANOVA	Analysis of variance
BFN	board feet net
C	Celsius
CCC	California Conservation Corps
CCR	California Code of Regulations
CDF	California Department of Forestry and Fire Protection
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulation
CHERT	County of Humboldt Extraction Review Team
CWHR	California Wildlife Habitat Relationships
cm	centimeter(s)
CMZ	channel migration zone
CNPS	California Native Plant Society
COE	(U.S. Army) Corps of Engineers
CPOM	coarse particulate organic matter
DBH	diameter at breast height
DI	disturbance index
DNR	(Washington) Department of Natural Resources
DOM	dissolved organic matter
EEZ	equipment exclusion zone
ELZ	equipment Limitation Zone
EPA	(U.S.) Environmental Protection Agency
ERA	equivalent roaded area
ESA	Endangered Species Act (Federal)
ESU	ecologically significant unit
FEIS	Final Environmental Impact Statement
FEMAT	Forest Ecosystem Management Assessment Team
FPOM	fine particulate organic matter
FPRs	(California) Forest Practice Rules
GIS	Geographic Information System
HCP	habitat conservation plan
ITP	incidental take permit

LEB	limited entry band
LMZ	limited management zone
LOP	(COE) Letter of Permission
LTO	licensed timber operator
LTSY	long-term sustained yield
LWD	large woody debris
m	meter(s)
MBFN	thousand board feet net
mm	millimeter(s)
MMCA	marbled murrelet conservation area (also "MCA" in some reports)
MWAT	maximum weekly average temperature
NCASI	National Council for Air and Stream Improvement
NCRWQCB	North Coast Regional Water Quality Control Board
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NSO	northern spotted owl
OB	outer band
POM	particulate organic matter
PWA	Pacific Watershed Associates
RHB	restricted harvest band
RMZ	riparian management zone
RPF	registered professional forester
RWQCB	Regional Water Quality Control Board
SEB	selective entry zone
SYP	Sustained Yield Plan
THP	Timber Harvesting Plan
USFWS	U.S. Fish and Wildlife Service
WAA	watershed assessment area
WLPZ	Watercourse and Lake Protection Zone

Definitions

Aggradation: Deposition in one place of material eroded from another. Aggradation raises the elevation of streambeds, floodplains, and the bottoms of other water bodies.

Anadromous: Moving from sea to fresh water for reproduction.

Bankfull width: Channel width between the tops of the most pronounced banks on either side of a stream reach.

Boulders: Substrate particles greater than 256 mm in diameter. Often subclassified as small (256-1,024 mm) and large (>1,024 mm) boulders.

Cable Yarding: The system of skidding (transporting) logs by means of cable (wire rope) to the yarding machine (yarder) or a landing while the yarder remains stationary.

Canopy Closure: The proportion of an area covered by tree crowns.

Canopy Cover: Vegetation projecting over a stream, including crown cover (generally more than 1 m above the water surface) and overhead cover (less than 1 m above the water).

Channel: Natural or artificial waterway of perceptible extent that periodically or continuously contains moving water.

Channel Migration Zone: Current boundaries of bankfull channel along with the portion of the floodplain that is likely to become part of the active channel in the next 50 years.

Cobble: Substrate particles 64-256 mm in diameter. Often subclassified as small (64-128 mm) and large (128-256) cobble.

Conservation: As defined in the federal Endangered Species Act, the use of all methods and procedures which are necessary to bring any endangered or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary; such measures and procedures include, but are not limited to, all activities associated with scientific resource management such as research, census, law enforcement, habitat acquisition and management, propagation, live trapping and transportation, and in rare cases, regulated taking (ESA, Section 3[3]).

Critical Habitat: Defined in the federal Endangered Species Act (1973) to include the area occupied by a species at the time it is listed, specific areas in the vicinity of the occupied habitat, and specific areas away from the occupied habitat considered essential for the conservation of the species.

Culvert: Buried pipe structure that allows streamflow or road drainage to pass under a road.

Cumulative Impact: The incremental environmental impact of an action together with impacts of past, present, and reasonably foreseeable actions (regardless of the source of the other actions).

Degradation: Erosional removal of materials from one place to another. Degradation lowers the elevation of streambeds and flood plains.

Drainage Area (Watershed): Total land area draining to any point in a stream, as measured on a map, aerial photo, or other horizontal, two-dimensional projection.

Embeddedness: Degree to which large particles (boulders, rubble, gravel) are surrounded or covered by fine sediment, usually measured in classes according to percent coverage.

Endangered Species: Any plant or animal species in danger of extinction in all or a significant part of its range.

Endangered Species Act: Federal act of 1973, as amended, 16 U.S.C. Sections 1531 - 1543; California act of 1984, as amended, Fish and Game Codes Sections 2050-2098.

Extinct: Disappeared as a species due to failure to reproduce in sufficient numbers to maintain succeeding generations.

Fine Sediments: Sediment with particle sizes of 2 mm and less, including salt, silt, and clay.

Fry: Life stage of trout and salmon between full absorption of the yolk sac and a somewhat arbitrarily defined fingerling or parr stage (generally reached by the end of the first summer).

Gradient: Average change in vertical elevation per unit of horizontal distance.

Gravel: Substrate particles between 2 and 64 mm in diameter.

Habitat Conservation Plan (HCP): An implementable program for the long-term protection and benefit of a species in a defined area; required as part of a Section 10(a) permit application under the federal Endangered Species Act.

Harass: A form of take under the federal ESA; defined in federal regulations as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3).

Harm: A form of take under the federal ESA; defined in federal regulations as an act which actually kills or injures wildlife. Such acts may include significant habitat modification or degradation where it actually kills wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3).

Incidental Take: The taking of a federally listed wildlife species, if such taking is incidental to, and not the purpose of, carrying out otherwise lawful activities.

Large Woody Debris (LWD): Any large piece of woody material that intrudes into a stream channel, whose smallest diameter is greater than 10 cm and whose length is greater than 1 m.

Limited Entry Band: The second band of the RMZ. Its placement is 30'-100' on Class I streams and 10' - 100' on Class II streams. Under certain circumstances, selected harvest can occur in this band

Mitigation: Measures undertaken to diminish or compensate for the negative impacts of a project or activity on the environment, including (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or (e) compensating for the impact by replacing or providing substitute resources or environments.

Monitoring: The process of collecting information to document implementation of mitigation measures and to evaluate whether or not the objectives of the habitat conservation plan are being realized.

Outer Band: The third band (100' - 170') of the RMZ on Class I streams. Under certain circumstances, selected harvest can occur in this band

Parr: Young salmonid, in the stage between alevin and smolt, that has developed distinctive dark “parr marks” on its sides and is actively feeding in fresh water.

Pool: Portion of a stream with reduced current velocity, often with deeper water than surrounding areas and with a smooth surface.

Population: A collection of individuals that share a common gene pool.

Redd: Nest made in gravel, consisting of a depression hydraulically dug by a fish for egg deposition and associated gravel mounds.

Registered Professional Forester (RPF): A person who holds a valid license as a professional forester pursuant to Article 3, Section 2, Division 1 of the California Public Resources Code.

Restricted Harvest Band: The most restrictive treatment zone in the RMZ. The RHB is 0-30' from the CMZ on Class I streams and 0-10' from the CMZ on Class II streams.

Riparian Management Zone: The area on either side of Class I or Class II streams that receives special treatments. May refer any combination of the following: Restricted Harvest Band, Limited Entry Band and/or Outer Band

Riparian Vegetation: Vegetation growing on or near the banks of a stream or other body of water in soils that exhibit some wetness characteristics during some portion of the growing season.

Run (fish): A group of fish migrating in a river (most often on a spawning migration) that may comprise one or many stocks.

Salmonids: Fish of the family Salmonidae, including salmon, trout, chars, whitefish, ciscoes, and grayling.

Sand: Substrate particles 0.061-2 mm in diameter.

Section 7: The section of the federal Endangered Species Act that provides for consultation between federal agencies and the U.S. Fish and Wildlife Service to ensure that any action authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species.

Section 9: The section of the federal Endangered Species Act that prohibits the "taking" of any listed species.

Section 10(a): The section of the federal Endangered Species Act that allows takings of a listed species for scientific purposes and incidental to otherwise lawful activities subject to approval of the Department of Interior or Department of Commerce as appropriate; both types of take require permits.

Section 2080: The section of the California Endangered Species Act that prohibits the "taking" of endangered and threatened species listed by the California Fish and Game Commission and species that the Commission has elevated to the status of candidates for such listing.

Section 2081, Section 2081 Permit: The section of the California Endangered Species Act that authorizes the California Department of Fish and Game to permit take of state listed species for scientific purposes and to enter into memoranda of understanding with persons, institutions, and agencies for the management of state listed species.

Section 2090, Section 2090 Consultation: The section of the California Endangered Species Act that requires all state lead agencies to consult with the California Department of Fish and Game regarding projects with impacts to state listed species; requires a written statement from the Department regarding whether or not the project will jeopardize the continued existence of the species.

Sediment: Fragments of rock, soil, and organic material transported and deposited in beds by wind, water, or other natural phenomena.

Sedimentation: Deposition of material suspended in water or air, usually when the velocity of the transporting medium drops below the level at which the material can be supported.

Sensitive Species: Here, a category of species designated for special protection by the California Board of Forestry.

Silt: Substrate particles 0.004-0.062 mm in diameter.

Slash: Woody residue left on the ground after trees are felled, or accumulated there as a result of a storm, fire, or silvicultural treatment.

Snag: A standing dead tree; sometimes a submerged fallen tree in large streams.

Species: Any distinct population of wildlife that interbreeds when mature.

Stream Order: A number from 1 to 6 or higher, ranked from headwaters to river terminus, that designates the relative position of a stream or stream segment in a drainage basin. First order streams have no discrete tributaries; the junction of two first order streams produces a second order stream; the junction of two second order streams produces a third order stream; etc.

Substrate: Mineral or organic material that forms the bed of a stream.

Suspended Sediment: That part of a stream's total sediment load carried in the water column.

Take: As defined in the federal Endangered Species Act, to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect a threatened or endangered species, or attempt to do so. See also "harm" and "harass."

Thalweg: The deepest point of a stream along any channel cross section.

Threatened Species: Any species or subspecies that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Timber Harvesting Plan (THP): A three-year plan for the harvesting of commercial timberlands that (1) must be prepared by a registered professional forester, (2) must be filed with and approved by the California Department of Forestry, and (3) must contain detailed information about the land to be harvested, the silviculture methods to be applied, special provisions (if any) to protect unique and sensitive resources in the area, the dates when timber operations will commence and conclude, and any other information that may be required by the State Board of Forestry.

Timberland: Land, other than land owned by the federal government, and land designated by the California Board of Forestry as experimental forest land, which is available for, and capable of, growing a crop of trees of any commercial species used to produce lumber and other forest products, including Christmas trees. Commercial species are determined by the State board on a district basis. (Z'berg-Nejedly Forest Practice Act of 1973)

Timber Operations: The cutting or removal of timber or other solid wood forest products, including Christmas trees, from timberlands for commercial purposes, together with all the work incidental thereto, including, but not limited to, construction and maintenance of roads, fuelbreaks, firebreaks, stream crossings, landings, skid trails, beds for the falling of trees, and fire hazard abatement, but excluding preparatory work such as tree marking, surveying, or road flagging. (Z'berg-Nejedly Forest Practice Act of 1973)

Watershed: see “Drainage Area.”

Wildlife Habitat Relationships (WHR) System: A computer model developed to correlate the characteristics of forests and other habitat types with the habitat requirements of certain wildlife species.

Yarding: Hauling of timber from the point of felling to a yard or landing.

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